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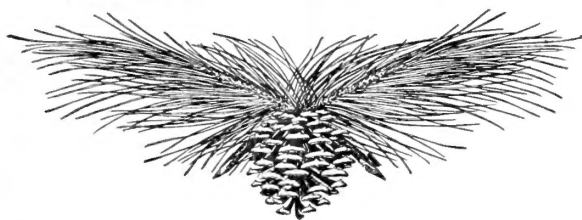
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# FOREST WORKER



*November, 1930*

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UNITED STATES DEPARTMENT OF AGRICULTURE

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## Announcements

### South Carolina Commercial Forestry Conference

A South Carolina commercial forestry conference is to be held during January, 1931, according to a decision arrived at by a group representing manufacturers, lumbermen, educators, landowners, farmers, foresters, and chambers of commerce of the State. L. I. Guion, of Lugoff, S. C., is chairman of an executive committee which will select a general committee and make plans for the meeting.

of the field of forestry, the program is planned to bring out much information on specific technical forestry problems. The Champion reforestation machine will be demonstrated.

At the thirtieth-birthday banquet of the society Gifford Pinchot will act as toastmaster and Raphael Zon will review the society's accomplishments.

Inquiries in regard to arrangements for the meeting should be addressed to W. R. Hine, Hill Building, Seventeenth and I Streets, NW., Washington, D. C.

### Meeting of Society of American Foresters

The matured program for the 1930 annual meeting of the Society of American Foresters, to be held in Washington, D. C., December 29-31, includes as speakers Arthur M. Hyde, Secretary of Agriculture; Ray Lyman Wilbur, Secretary of the Interior; R. Y. Stuart, Chief of the Forest Service; John C. Merriam, president of the Carnegie Institution of Washington; Paul G. Redington, chief of the Bureau of Biological Survey and president of the society; Elwood Wilson, of the Canadian Society of Forest Engineers; and W. E. Hiley, of Oxford University. In addition to discussion of the land policy of the United States, examples of successful private forestry practice, and the expansion

### Ohio State University Needs Forestry Publications

E. G. Wiesehuegel, professor of forestry at the Ohio State University, finds himself in need of library material not now available for use in connection with his teaching, and will be glad to hear from organizations, institutions, and individuals wishing to cooperate with the university by providing copies of forestry publications. Professor Wiesehuegel may be addressed in care of the Department of Horticulture and Forestry, Ohio State University, Columbus, Ohio.



NOTE.—For announcements regarding forestry fellowships, see page 7.

The FOREST WORKER is published by the Forest Service, United States Department of Agriculture, Washington, D. C. Jean Kerr, editor. Material offered for publication in the FOREST WORKER should be addressed to the editor.

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# FOREST WORKER

Washington, D. C.

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Vol. 6, No. 6

## State Forestry

### Height Growth of Private Forest Plantations in Pennsylvania

District Forester E. F. Brouse, of the Valley Forge district of Pennsylvania, warns fellow foresters to consider carefully their responses to the prospective planter's query "How fast will the trees grow?" The height-growth figures that fasten themselves in one's mind, he points out, are those for the most successful plantations; besides, the basis of height-growth data is usually the plantation on public land rather than the private plantation, which as a rule has less skillful care and consequently makes poorer growth. As some indication of the growth that may be expected of private forest plantations in Pennsylvania Mr. Brouse presents data on the growth of a number of such plantations in 11 counties in all parts of that State. Determination of height growth was not the primary purpose of the study in which these figures were collected, which explains a wide variation in the number of measurements made for individual species. The fact that the plantations were chosen without discrimination enhances the probability that the figures for northern white pine, Scotch pine, and Norway spruce are close to being true averages. For the other species listed the figures represent too few plantations to carry much weight. For each of the plantations the average height growth was determined by measuring a representative number of trees, usually from 50 to 150, to tenths of a foot. The figures are as follows:

Species	Average height of trees, by age			Number of plantations measured	Number of trees in plantations	Percentage of plantations in open areas
	5 years	10 years	15 years			
Northern white pine.....	2.0	5.5	10.5	201	749,800	83.1
Scotch pine.....	3.0	7.8	14.0	58	161,400	81.0
Pitch pine.....	3.4	8.2	13.2	25	119,000	88.0
Norway pine.....	2.5	7.5	-----	27	115,900	58.9
Norway spruce.....	1.6	4.5	-----	98	366,100	81.6
Japanese larch.....	2.4	6.9	-----	38	101,900	71.0

The fact that at the age of 10 years pitch pine showed a greater average height growth than any of the other species listed is partly explained by the fact that only 12 per cent of the trees of this species were underplanted. Of the Norway pines 40 per cent were planted among and under other trees, yet this tree outgrew the Scotch pine and the Japanese larch. Norway spruce bore out the common impression that it is slow in starting. A disappointment for Mr. Brouse was the slow growth of the northern white pine. Numbers of plantations of northern white pine in Pennsylvania to his knowledge have averaged from 15 to 20 feet in height at 10 to 12 years, and several have reached a height of 64 feet in 22 years. A possible explanation of the record made by the northern white pine is offered by the fact that this tree is cursed with numerous enemies and that it is more exacting in soil requirements than most of the others listed. One of the best Scotch pine plantations examined showed an average height of 38 feet at 16 years of age.

In point of survival the plantations represented by these data were only 43 per cent successful. Their failure to show a higher percentage of survival and more rapid growth is attributed by Mr. Brouse to improper selection of species, careless handling and planting, underplanting, pasturing, insects, fungi, and "all other abuses it is possible to heap upon them."

### New Forest Fire Laws of Virginia

Virginia forest wardens are authorized by a law of 1930 to summon any able-bodied male between the ages of 18 and 50 to assist in extinguishing any forest fire in a county organized for forest fire control under State direction. Persons so summoned will be paid for their services at the rate provided for in the State forest service wage scale. Refusal to respond to a warden's summons without a valid reason is a misdemeanor punishable by a fine of from \$10 to \$25.

Under another law recently enacted in Virginia, to build or use a fire in the open air and leave it unextinguished and untended is a misdemeanor punishable by a fine of from \$10 to \$100. The offender is held liable for the full amount of all costs incurred in extinguishing the fire.

## Fuel from State Forests Free to Connecticut's Unemployed

Fuel is one thing for lack of which Connecticut's unemployed need not suffer this winter, says State Forester Austin F. Hawes in a letter which he has circulated to the mayors of a number of cities. In Mr. Hawes's opinion the wood now going to waste on Connecticut State forests amounts to 50,000 cords, and as much more could be cut with results beneficial to growing conditions on the forests. Wood that is going to waste or that could be removed with benefit to the forests will be given free to any who will cut and remove it. A large quantity of dead wood is available, which can be burned at once, and green wood cut early in the season will be ready for burning before the end of the winter. This will consist largely of gray birch, red maple, and defective oak and other hardwoods.

Written permits will be issued to individuals or organizations to cut and remove wood under the supervision of forest rangers. All live trees to be cut will be marked by rangers. Individual permits will be limited to 10 cords. Charitable organizations, employers, or community groups may obtain permits for cutting and removing considerable quantities of wood to be distributed without profit.

Mr. Hawes points out that several Connecticut cities, as well as smaller communities, are within easy hauling distance of the State forests. The Mattatuck Forest is within 4 miles of Waterbury and Thomaston, and the Peoples Forest is within 6 miles of Winsted and New Hartford. Hartford, Torrington, Middletown, New London, and other cities are within 10 to 15 miles of State forests.

## Indiana Develops State Forests

Indiana is progressing steadily in acquiring second-growth timberland and waste areas for State forests, reports State Forester Ralph F. Wilcox. A specific forestry levy of 2 mills brings in \$100,000 each year for the operation of the State nursery and the purchase, supervision, and development of land for State forests.

The Clark County State Forest, Henryville, Ind., which when originally purchased in 1903 consisted of 2,000 acres, has been increased to 5,300 acres. Practically the whole area is well stocked with oak and hickory. A sawmill operated at the State forest each year cuts 2,000 or 3,000 crossties from over-mature and defective trees. During the past three years net logging profits for individual tracts have ranged from \$16 to \$32 per acre. The cuttings leave the stands in better silvicultural and earning condition than before. All costs and receipts are recorded separately for each tract. Selective cutting on these units will again be possible in about 10 or 15 years.

A new State forest of 9,000 acres has been purchased in Morgan and Monroe Counties, near Martinsville, within 35 miles of Indianapolis. About 90 per cent of the area is in forest cover, although practically all merchantable material has been removed and the stands have been severely injured by forest fires during the past few years. A lookout tower has been erected and a system of organized protection for the new forest and for surrounding woodlands in private ownership has been put into effect. It is planned to enlarge this forest to 25,000 acres.

The Indiana Department of Conservation has adopted the plan of establishing a 5,000 or 6,000 acre State forest each year in the southern part of the State. At least 500,000 acres of land in Indiana is considered by the Department to be suitable for State forests. The State forests are open for recreation and are used to demonstrate methods of tree planting, protection, and forest improvement.

## The Elliott State Forest of Oregon

Oregon's first State forest has been named in memory of the late F. A. Elliott, for 19 years Oregon State forester. The Elliott State Forest, formerly known as the Millicoma tract, comprises 70,000 acres of land lying south of the Umpqua River between Scottsburg and Reedsport. To acquire it the State exchanged a number of isolated school sections within national forest boundaries for one block of Government-owned land on the Siuslaw National Forest. The move to acquire the tract in this way was inaugurated by Mr. Elliott and Governor West in 1912.

A large part of the present State forest lay in the path of the Coos Bay fire of 1868, but the burned-over portion is described as having largely come back to an excellent stand of second-growth Douglas fir now approaching merchantable size. Scenic features of the forest are the Millicoma River, Elk Lake in the interior, and Loon Lake on the eastern boundary, and the precipitous bluffs and mountains bordering the Umpqua River throughout the length of the forest.



The Massachusetts State forest act has been amended to permit inclusion of 150,000 acres of land in State forests. Previously the limit was set at 100,000 acres.



The Virginia Bureau of Parks has completed examination of more than one-third of the area proposed for State purchase for inclusion in the Shenandoah National Park. At the end of October about 120,000 acres out of a total area of 312,000 acres had been examined. The acquisition work is being directed by S. H. Marsh, formerly of the United States Forest Service.

## New Machine Eliminates Much Labor from Forest Planting

As many as 2,500 trees can be planted in an hour by the use of the duplex reforestation machine developed by H. R. Walling of the Champion Sheet Metal Co. (Inc.), Cortland, N. Y., the New York Conservation Department reports. The machine is drawn by a tractor, and its operation requires two men in addition to the driver. A fourth man serves as relief operator and replenishes the machine with trees. (Approximately 6,000 3-year transplants can be carried on the machine.) By the use of the "simplex" type of the same machine, which is drawn by horses and is operated by one man in addition to the driver, it is possible to plant 1,500 trees per hour. With a simplex machine the department planted 75,000 trees on the Brookfield reforestation area last spring at a cost (including a \$50 transportation charge) of \$3.36 per 1,000 trees, which is about one-third as much as it would have cost to plant the area by hand. With the duplex machine, it is estimated, large-scale plantings can be carried out at a cost of \$2 per 1,000 trees. The department has provided itself with one simplex and two duplex machines.

The duplex machine cuts two furrows, 6 feet apart, by means of a pair of shoe-shaped plows which are attached to the sides of a low platform. Before each plow runs a steel coulter wheel which cuts the sod. In the vertical shank attaching each plow to the platform is a wide slot extending to the sole of the plow. On the front of the platform, before the seats for the planters, are several steel rings in which pails of trees are set. Back of these are small, shallow troughs containing water, in which trees taken from the pails are placed in readiness for planting. As the machine moves over the ground a trailing wheel provided with a commutator rings a bell at intervals of 6 feet. At this signal each planter passes a tree through the slot in the plow next which he is seated, holding it until it assumes an upright position in the ground. Two tamping wheels, the treads of which slant slightly inward, almost instantly pass on either side of the tree, and these are at once followed by a large tamping or packing wheel with divided tread. By taking care to grasp each tree at the point where the stem emerged from the soil of the seed bed the planters can obtain the desired planting depth.

The machine is supported on its hind wheels. In the front wheels the axle is located at some distance from the center, so that the wheels simply drag until the plow encounters an obstruction. The front wheels are then so thrown as to lift the front end of the apparatus and bring the plows practically out of the ground. As an additional safeguard against jamming on rough ground, the coupling of the tractor is made with a spring so that when the strain goes beyond a

certain point the machine is automatically released. These features and the strong construction of the machine are said by the makers to permit its successful use on extremely rough areas and areas having a heavy brush cover.

The machine is adapted to planting trees of various sizes, from 1-year seedlings to 4-year transplants.

In a September 12 report on its experience with this reforestation machine the New York Conservation Department stated that a recent check of the trees planted with the machine last spring indicated results comparing favorably with those usually obtained by hand planting.

## Porto Rico Nurseries Increase Production

With no increase in nursery expenditures, the Porto Rico Division of Forestry produced about 40 per cent more forest planting stock in the year ending with June, 1930, than in any preceding year. The increase in production was effected mainly through a cut in the number of species produced. With about 35 of the species used in recent years eliminated, sowings in the nursery were principally of about 40 species known to do especially well in Porto Rico. This year the number of species grown may be further reduced.

At one time and another nearly 500 species of forest trees have been grown in the Porto Rico nurseries and sent out to various sections of the island for trial.

The total output of the insular nurseries for the fiscal year 1930 was 1,366,275 trees. Of this number 141,059 were planted on insular forests, 25,938 were distributed to schools for Arbor Day planting, about 48,000 were used for roadside planting, and the remainder were distributed to private individuals, free of charge, for planting on their own land. About 1 per cent of the total output were distributed for planting as ornamentals on private land, on the theory that to familiarize the public with the rapidity of tree growth in Porto Rico will stimulate public interest in forest planting.

In periods of exceptional drought during the past year several men were kept busy day and night watering the beds in the insular nurseries, with the result that no unusual losses occurred.

Twenty new concrete seed beds were constructed in the forestry division's principal nursery, at Rio Piedras, during March and April, increasing its average seedling capacity to 900,000 a year. This nursery contains 405 transplant beds, 4 by 25 feet, which have an annual capacity of about 200,000 trees.

For shading nursery beds in which very fine seed such as that of Eucalyptus and Casuarina have been sown, cloth has given much better results than lath in the Porto Rico nurseries, where lath shades are in general use. Water which collected on the sides of the lath, either during rainstorms or when the beds



were watered artificially, washed a large percentage of these fine seed out of the soil. No such trouble was experienced when cloth shades were used.

This year the insular forester, W. P. Kramer, plans to make a study of the costs of producing forest trees of the individual species most important in Porto Rico.

## New Hampshire to Distribute Root-Pruned Seedlings

The New Hampshire Forestry Department is introducing to the public of that State a type of planting stock not previously distributed from its nursery, 3-year root-pruned seedlings. Tests carried out by both the forestry department and the State university during a period of two years, under various conditions, have shown that 3-year root-pruned seedlings are no less desirable than 3-year transplants and on most sites are a satisfactory substitute for 4-year trees. The seedlings are grown in less dense stands than as if they were to be transplanted within the nursery. At the beginning of the third year's growth any surplus trees are weeded out and the roots are cut 4 or 5 inches below the surface of the soil. This prevents excessive development of lower roots and stimulates the growth of roots near the surface.

This type of planting stock costs about \$2.50 per 1,000 less than 4-year transplants. It is offered by the department at \$4.50 per 1,000 for northern white pine and at \$5.50 per 1,000 for Norway pine, white spruce, and Norway spruce.

## Fall-Planted Pines Thrive in East Texas

Fall and early winter seem to be as safe a time as spring for planting pines in east Texas, the State forest service reports on the basis of results obtained from a planting made last year. In the period December 4-14, 1929, the service planted more than 20 acres of the Newton County State Forest, near Kirbyville, with shortleaf, loblolly, longleaf, and slash pine. Practically all the stock had been grown at the State forest near Conroe. The trees experienced exceptionally unfavorable conditions: Sawdust was used in packing them for shipment; freezing weather began only 8 days after they were planted, and continued for 9 successive days, accompanied by a 5-inch snowfall; in January there were 10 days of even colder weather; and a drought that began May 24 continued past mid-August, with but 2 inches of rainfall during that period. On July 9, however, the plantation in which losses had been greatest showed a 52 per cent survival, and the best plantation showed a survival of 98 per cent.

Trees from shaded and unshaded nursery beds seemed to have had equal chance to survive. Plants from shaded beds showed slightly greater average heights.

The most marked distinction between the trees grown in shaded and those grown in unshaded beds consisted in the susceptibility of slash pine from shaded beds to freezing. Slash pine from shaded beds showed about 5 per cent greater loss from this cause than slash pine from unshaded beds. Native species showed very little loss from freezing. The greatest loss that could be attributed largely to winter freezing was 15 per cent, occurring in a slash pine plantation. At the date of the examination the heaviest loss from drought was 15 per cent. This likewise occurred in a slash pine plantation.

Through earlier experiments the Texas Forest Service has found that in east Texas slash pine, if it survives the first year after planting, is very hardy and grows faster than any of the native species.

Specimens of trees heeled in at both State nurseries were lifted from time to time during the winter for observation. These gave evidence that the roots of the fall-planted trees continued to grow through the winter, although height growth did not begin until late March.

## Walnut Planting Campaign in Central States

Frank S. Betz, of Hammond, Ind., is promoting a campaign for the planting of black walnuts in Indiana, Illinois, and Missouri in the spring of 1931. Mr. Betz recommends the planting of the nut in the place where it is desired to have the tree grow, rather than the distribution of nursery-grown seedlings. He hopes that under the cooperative plan he advocates the State forestry organizations of Indiana, Illinois, and Missouri will distribute 10,000,000 walnuts to school children, Boy Scouts, and others for planting next spring. Nuts collected this fall are to be stratified over winter and distributed in March and April.

The State forester of Indiana in cooperation with Mr. Betz plans to distribute stratified walnuts in the spring of 1931 at a charge of \$1.50 for one-half bushel or \$2.75 for a bushel, making one-half bushel the minimum quantity to be sent out as one order.

Mr. Betz, who retired from a manufacturing business in 1915, has in the past few years distributed millions of forest trees and many millions of tree seed to school children, Boy Scouts, farmers, and others. With each package of seed he gives illustrated directions for planting.

The Vermont Forest Service has made about 1,200 feet of motion pictures showing Vermont forests and forestry practice. Assistant Forester C. R. Lockard was the photographer. The service offers to give a lecture illustrated with films to any organization in the State requesting one.



## North Carolina Forestry Association Meets

Appealing to the new North Carolina Legislature to correct the cut made by the preceding legislature in forestry appropriations, the North Carolina Forestry Association, meeting at North Wilkesboro, September 9-11, approved a draft of a bill that would provide for acquisition of lands for State forests and State parks and urged that the legislature provide for adequate maintenance of forestry instruction in the State college and for carrying forestry education into all the high schools of the State. In order that a study might be made of the relation of forests to streamflow, erosion, and the silting up of streams in the southern Appalachian and Piedmont regions the association agreed to ask the North Carolina delegation in Congress to work for a \$50,000 Federal appropriation for this purpose under provisions of the McSweeney-McNary Act. It urged the legislature to authorize work needed to complete a land and economic survey of the State, and pledged itself to endeavor to present to the public the need for the proposed amendment to the State constitution which would provide for classification of property for purposes of taxation.

Officers of the association for the coming year are president, John L. Cobbs, jr.; secretary, R. W. Graeber; district vice presidents, K. Clyde Council (Wanamish), H. C. Landon (North Wilkesboro), and Burnham S. Colburn (Biltmore).

## Sixth Forest Protection Unit Established in Texas

New cooperative agreements entered into by the Texas Forest Service and a group of landowners provide for intensive fire protection on 250,000 acres of land in Polk, Tyler, Hardin, and Liberty Counties. The owners are the W. T. Carter & Bro. Lumber Co., the Kirby Lumber Co., the Texas Longleaf Lumber Co., and John Henry Kirby. Practically all the land is well stocked with second-growth pine, and considerable areas of old-growth shortleaf and longleaf pine are included. The gross acreage that must be covered in protecting the unit is approximately 500,000.

Two steel lookout towers, one 95 and one 120 feet in height, have been erected. At four points lookout platforms have been built in tall trees steadied by guy wires and have been made accessible by steel ladders. These, as well as the towers, have telephone connections and are equipped with maps and fire finders. The protection force will include 2 lookout men, 2 patrolmen, and 4 "smokechasers." Thirty farmers will hold themselves in readiness for service as forest guards.

The six units now under intensive fire protection in Texas total about 1,500,000 acres. A "blanket patrol" system maintained by the State forest service

covers 6,500,000 acres in addition, with individual patrolmen assigned to districts of from 100,000 to 300,000 acres each.

## A New Forest Nursery for New Jersey

Because greater quantities of shortleaf and loblolly pine are needed for reforesting burned areas on New Jersey State forests and because it is difficult to grow these species in the climatic conditions of the Washington Crossing Nursery, near Trenton, a new State forest nursery is to be developed in southern New Jersey. The site chosen is about 40 acres of cleared land at Green Bank, Burlington County, on the banks of the Mullica River. A portion of the new nursery will be put in seed beds in the spring of 1931.

The September inventory of stock at the Washington Crossing Nursery showed 1,600,000 seedlings and transplants available for distribution next spring. One-year seedlings were found to total 2,310,000.

Sulphuric acid is now used on all Norway and northern white pine seed beds at the Washington Crossing Nursery as a preventive of damping off, a pint of the acid being used to each 100 square feet of seed-bed surface.

More than 1,000,000 seedlings are being grown in Alabama's State forest nursery in preparation for planting on nonagricultural lands owned by farmers. They are to be distributed without charge in lots of 500 or 1,000, and additional quantities may be acquired by individual farmers at the cost of growing, packing, and shipping the trees. The species grown, in order of numbers, are longleaf pine, black locust, slash pine, sycamore, laurel oak, loblolly pine, catalpa, black walnut, persimmon, Russian mulberry, and bald cypress.

Another group of Georgia landowners has organized to cooperate with the State and Federal Governments in protecting timberlands from fire. The new protective unit is made up of 17,145 acres in Liberty County, with Hinesville as headquarters. This is the thirty-second timber-protective organization formed in Georgia. Its officers are J. B. Fraser, president; R. L. Rahn, vice president; and W. I. Stafford, secretary-treasurer.

Deer may be shot in western North Carolina only in November and December, according to a decision recently announced by the State board of conservation and development after a public hearing on the matter. In eastern North Carolina, as formerly throughout the State, the open season for deer extends from October 1 to January 15. Another recent decision of the board closes the season for trapping fur-bearing animals in western North Carolina for two years.

## Four Million Trees Available in Louisiana State Nursery

The Louisiana Division of Forestry is offering 3,000,000 1-year-old pine seedlings for sale to owners of land in the State this winter. Longleaf, slash, loblolly, and shortleaf pines are available at the State nursery at \$1.50 per 1,000, f. o. b. Woodworth, La. In addition 1,000,000 hardwood seedlings are available. The hardwoods are priced at from \$3 to \$5 per 1,000. This year, for the first time, the division of forestry in

cooperation with the extension service has arranged to distribute forest tree seedlings to 4-H club members free of charge other than that for parcel post or express.



Smoking of tobacco and building of campfires within woodlands, and burning of brush and other rubbish within woodland or within 200 feet of woodland, have been forbidden in Pennsylvania during the 1930 hunting season, by proclamation of the Governor.

# Education and Extension

## Erosion Control Demonstrated on Mississippi Farms

About 300 landowners and others saw erosion-control measures demonstrated on north Mississippi farms in the second week of September, 1930. State and Federal foresters, highway officials, specialists of the Mississippi Agricultural College, and county agricultural agents took part in the demonstrations. In Benton County the site of one demonstration was a gully 10 feet deep, in loam and clay soil underlaid with sand, that had necessitated relocation of the county highway seven years previously and was again eating into the highway as well as into a cotton field. When the drought-hardened soil at the head of the gully had been broken with dynamite much of the earth on the steep banks was loosened with the county tractor and road plow and was rolled below. Agricultural high-school students helped build brush dams on gullied areas treated in Benton and Carroll Counties. Bermuda sods were placed above the brush dams to assist in holding the soil that would be caught behind the dams. Other demonstrations were carried out in Marshall and Panola Counties. On all the demonstration areas the landowners intend to plant black locust. It was planned to continue the series of demonstrations in October and November in Lafayette, Attala, and Pontotoc Counties.

A recent survey by the Southern Forest Experiment Station covering five counties of the silt loam uplands of northern Mississippi indicated that erosion is actively in progress on 34 per cent of the land area of Marshall County, 28 per cent of Lafayette County, 23 per cent of Holmes County, and 18 per cent of Carroll County, and that in Panola County 17 per cent of the land is suffering from excessive soil wash. According to these figures erosion is actively progressing on at least 800,000 acres of land surface in this section of Mississippi. Of this area approximately 440,000 acres, it is estimated, has already been removed from cultivation. The station is now making intensive studies

of certain critically eroded areas in northern Mississippi, with particular attention to means of reestablishing vegetation, especially a forest cover, and to the relative values of different types of cover in controlling and preventing erosion.

## Forest Protection Campaign in Dallas County, Ark.

A county forestry committee composed of farmers, mill men, and business men had charge of a campaign against forest fires that was carried out this year in Dallas County, Ark., at the instance of Extension Forester Charles A. Gillett. Letters addressed to every farmer in the county told of financial gains to be expected from forest protection and asked those interested in keeping fire out of their timberlands to reply. Township committeemen helped to canvass the woodland owners in their communities. Farmers who signified an interest were called together for meetings at which fire-protection methods were explained with the help of motion pictures. More than 50 of the farmers adopted fire-protection measures, and had signs erected before their homes stating that they had done so. Through these men and the results of their protection efforts it is hoped to reach confirmed woods burners in their communities.

A 67-mile tour of the county this fall satisfied members of the county committee that although fire conditions were exceptionally bad in 1930 less land was burned over than usual.

Mr. Gillett is planning for similar campaigns in other counties next year.



An endowment of \$200,000 recently became available for maintaining forest research work on the Harvard Forest, Petersham, Mass. Half of this amount was given by the Charles Lathrop Pack Forestry Trust.

## National Research Council Fellowships Available

Appointments to fellowships in the biological sciences, including forestry, are to be considered by a National Research Council board about the first week in February, 1931. The fellowships are open to citizens of the United States and Canada, of both sexes, who possess the Ph. D. degree or have done work equivalent to that required for the degree. They are intended to promote research in fundamental branches of the sciences, specifically through training of selected investigators. The present policy is to restrict appointment to applicants in the early stages of a research career who have demonstrated ability of a high order and who give promise of developing individual judgment and point of view in investigative work. The appointments are for full time; fellows may, however, be permitted to give a portion of their time to advanced teaching or advanced courses of study. Fellows are appointed for a period of 12 months only, but are eligible for reappointment. American fellowships carry a basic stipend of \$1,800, which may be adjusted to individual needs. For foreign fellowships the stipend is \$1,800 or \$2,400 according to whether the fellow is single or married, with additional allowances to cover travel. Appointment may become effective at any time of year.

Persons wishing to be considered for appointment to these fellowships should send inquiries as to the mode of application to the Secretary, Board of Fellowships in the Biological Sciences, National Research Council, B and Twenty-first Streets NW., Washington, D. C.

## Pack Forestry Fellowships Available for 1931-32

Six or eight fellowships in forestry are offered by the Charles Lathrop Pack Forestry Trust for the year 1931-32. The purpose of the fellowships is "to encourage men who have shown unusual intellectual and personal qualities to obtain training that will best equip them for responsible work either in the general practice of forestry, in the forest industries, in the teaching of forestry, in forest research, or in the development of public forest policy." Initiative, resourcefulness, industry, adaptability, and imagination are mentioned as qualifications that will have special weight in determining the awards. No restrictions are made as to age, educational status, or practical experience; ordinarily, however, fellowships will be granted only to those who have completed an undergraduate college course or its equivalent, and only to American or Canadian citizens. Men still in school and men already engaged in professional work are eligible. Grants may be made for study at a school of forestry or an institute of research, on a forest under management, in association with forest industries, or

in travel. Appointments may be made for 12 months or for a shorter or longer period, and may be renewed. Fellows will be expected to devote their full time to the work for the purpose of which the fellowships are awarded. In general the grants will range from \$500 to \$2,500.

Applications for fellowships must be made in writing, on a prescribed form, on or before January 15, 1931, to the Secretary of the Charles Lathrop Pack Forest Education Board, 1214 Sixteenth Street NW., Washington, D. C.

## Gifts to the Oregon State School of Forestry

A fellowship in reforestation has been created in the school of forestry, Oregon State College, through a gift of \$10,000 received from Mary J. L. McDonald, of San Francisco. For the current year the fellowship has been granted to Vondis E. Miller, a 1930 graduate of the school. Mr. Miller's thesis will deal with the preparation of a management plan for the school forest. A gift of \$2,000 recently received from the Charles Lathrop Pack Forestry Foundation enables the school to offer a prize for which students may compete by writing articles for publication on an approved forestry subject.

## Study of Washington Range Plants

The forestry and range management department of the State College of Washington is cooperating with the Animal Husbandry Division of the Washington Agricultural Experiment Station in a study of a few of the more important winter range plants of the State. A chemical study will be made of each of the plants, and quantities of each will be fed to six sheep in metabolism crates under controlled conditions to determine their digestibility and nutritive values. The study will deal first with slender wheatgrass (*Agropyron tenerum*) and Idaho fescue (*Festuca idahoensis*, syn. *F. ovina ingrata*), both of which often occur in practically pure stands.

## Conservation Teaching Proposed for Public Schools of Pennsylvania

A plan to have conservation education introduced in all the public schools of Pennsylvania is being advanced by the conservation council of that State. The council proposes that the position of director of conservation and nature education be created in the State department of public instruction, and that conservation education be included by law in the curricula of all public schools from the primary grades through the high schools. It proposes further that nature leaflets and pamphlets be published by the State for the use of teachers,

## Philippine Forest School 20 Years Old

The forest school of the University of the Philippines celebrated in June, 1930, the twentieth anniversary of its origin. Created in 1910 as a part of the college of agriculture, at Los Banos, Laguna, since 1916 the school has been independent of the college.

Maj. George P. Ahern was the director of forestry under whom forestry instruction was instituted in the Philippines. Royal F. Nash was the first head of the forest school and was succeeded in 1911 by D. N. Matthews.

Originally the school offered a 2-year course at the completion of which students received certificates as forest rangers. A 3-year course leading to the degree of bachelor of science in forestry was offered, also, to men having completed the ranger course. Students were maintained at Government expense during the 2-year course, the "pensionados" being bound by contract to serve in the bureau of forestry as rangers for two years after graduation. This system has now been abolished. At present the standard course is one of four years, leading to the degree of bachelor of science in forestry. Students completing the first year of this course are eligible for appointment as forest guards or guard scalers in the bureau of forestry and those completing the first two years' work are eligible for employment as rangers. Graduation from a high school or other secondary school is required for admission.

The forest school is located within the Makiling Forest Reserve, on Mount Makiling, which contains many of the principal forest types of the Philippines and affords opportunity for all the different kinds of field work required except steam logging and saw-milling. For work of this kind extensive lumbering operations are visited.

Graduates of the school number 381, of whom 232 are employed in the bureau of forestry, 17 by lumber companies, and 23 in forestry work in other countries. Ten students from China and 2 from Guam have been graduated, and 11 Filipinos have been trained in the school at the expense of the British North Borneo Government in preparation for forestry service under that Government.

Except for Arthur F. Fischer, since 1917 director of the bureau of forestry and dean of the forest school, the Philippine Bureau of Forestry is now manned entirely by Filipinos.

## Local Pulpwood Market Encourages Farm Forestry in Louisiana

Farmers of Louisiana received \$1,650,589 for farm timber sold as pulpwood during 1929, according to figures compiled by the Louisiana Agricultural Extension Service. This sum was paid by the six pulp and paper mills of the State to farmers in 13 parishes. One mill purchased its entire pulpwood requirements

from farmers, paying them more than \$800,000; another mill purchased 80 per cent of its pulpwood from farmers. The average price paid at the mill is \$5 a cord. Many Louisiana farmers, encouraged by the excellent local market for pulpwood, are beginning to grow timber as a crop, says Extension Forester Robert Moore, who adds that under forestry management the average farm woodland in that State will grow one cord of wood per acre annually.

## County Forestry Councils at Work in Maryland

County forestry councils composed of landowners and timber users have been formed within the past two years in six counties of Maryland—Talbot, Dorchester, Wicomico, Caroline, Harford, and Worcester. The first definite project undertaken by each of the councils, with the guidance of the University of Maryland extension service, was an idle-land survey and a planting campaign. In five of the counties the number of forest trees planted during the past two years ranges from 31,000 to 87,000. The extension service plans to issue from time to time a mimeographed news-letter containing reports and suggestions on forestry as developed by members of the councils, the first number of which appeared in September of this year.

## Idaho Legionnaires Undertake Forestry Educational Work

The American Legion, Department of Idaho, will cooperate in public forestry educational work under the terms of resolutions adopted at its twelfth annual convention, held at Idaho Falls in August. The Legion proposes to obtain educational material relating to the forests and forest resources of Idaho from the Idaho State School of Forestry, the State forester, and the United States Forest Service, and through its various posts to distribute this material to Boy Scouts, Camp Fire Girls, chambers of commerce, commercial clubs, and public schools. In accepting its conservation and reforestation committee's report the convention approved recommendations that each post make a study of conservation and reforestation problems of its locality and report its findings to the department, and that the department encourage Idaho municipalities to establish community forests for the protection of watersheds and wild life and for recreational purposes. The report urged that the Legion continue to encourage the planting of trees on school grounds, municipal parks, and playgrounds and along public highways, and recommended reforestation of burned-over and denuded areas by the Boy Scouts, the Camp Fire Girls, and similar organizations. The final objective outlined by the committee, on which Franklin Girard served as chairman, was the development in each individual Idaho citizen of a consciousness

of forest fire danger and of a feeling of responsibility for observing precautions against fire and warning others to do so.

### Four-H Club Champions Attend New York Forestry Tour

By good work on 4-H club forestry projects 28 New York boys won the privilege of attending this year's forestry tour of the New York State Conservation Department. One of the boys was sent as State winner in the second-year (forest-appreciation) project and the others as county winners in either the second-year or the first-year (tree-planting) project. The boys' expenses were paid with funds supplied by several forestry and conservation organizations, a university, a newspaper, and a chamber of commerce. Eleven 4-H club leaders likewise participated in the tour, which had a total attendance of 150. The tour started at the Saratoga State Forest Nursery and continued for four days with visits to private and public forest plantations, in which the trees were of many varieties and of ages ranging up to 44 years, throughout the eastern and central Adirondack region.

### Junior Patrol Effective in Louisiana

Four-H club boys patrolling 10,000 acres of land in the vicinity of Fisher, Sabine Parish, La., have proved themselves as efficient as adult patrolmen, says Extension Forester Robert Moore. In the year ending June 30, 1930, the 18 fires occurring on the area were held by the boys to an average of 14.16 acres each. The average acreage per fire for the whole of the protection unit including the area protected by the boys was 60.6.

Junior patrols of 4-H boys have been an integral part of the State forest fire protection system in Louisiana since 1927. They are paid 1 cent for each acre in the area patrolled and a bonus of \$25 if less than 1 per cent of the area is burned. In some areas of unusual hazard compensation is at a higher rate. In communities where junior patrols have been organized their activities have markedly increased the interest of the public in fire prevention, Mr. Moore has found.

Forestry oratorical contests were conducted by the Tennessee Forest Service this fall for the second time in the schools of Fentress County and for the first time in the schools of Cumberland and Morgan Counties. Seventh and eighth grade pupils were eligible. For the final contest, held in the county seat following elimination contests in district centers, prizes totaling \$40 were raised by popular subscription in each county. Forestry information material provided by the State forest service for use in preparing orations was distributed to 941 pupils.

The Institute of Paper Chemistry founded a year ago as a graduate school affiliated with Lawrence College, Appleton, Wis., announces that 17 college graduates, representing 15 educational institutions and 12 States, have enrolled for its second term. A research fellowship established in the institute by the Masonite Corporation of Laurel, Miss., has been awarded to E. F. Foreman, a graduate of the University of Illinois. This fellowship is established for three years.

## Forest Service Notes

### Estimates Enlarged as to National Forest Road and Trail Requirements

By G. H. LAUTZ, United States Forest Service

Estimates as to the mileage of roads and trails desired for inclusion in the road and trail systems proposed for the national forests were increased during the past year. An addition of 691 miles was made to the previous estimate of forest highways, that is, roads that while of value to the forests are important primarily to the States containing the forests and to counties and communities within and adjacent to the forests; 5,904 miles were added to the estimate of forest development roads, that is, roads required for the protection, administration, development, and utilization of the national forests; and the estimate of trails was

increased by 18,681 miles. The new totals are 16,023, 51,703, and 149,768 miles, respectively. The expenditures required to complete the three systems are estimated at \$166,097,400, \$60,497,200, and \$5,993,600, respectively, or at a total of \$232,588,200. The cost per mile of the required construction will be approximately \$19,057 for forest highways, \$1,911 for forest development roads, and \$130 for trails.

The past fiscal year saw 1,726 miles of roads and 6,175 miles of trails constructed, and 19,898 miles of roadway and 65,785 miles of trails maintained. This represents an expenditure of \$10,356,172, of which \$8,883,595 was contributed by the Federal Government and \$1,472,577 by cooperating agencies.

The total expenditure on forest roads and trails to July 1, 1930, was \$111,179,871, representing \$89,122,195 specifically appropriated for road construction,

\$2,152,933 of other Federal funds, and \$19,904,743 of cooperator's funds. Through this expenditure 18,455 miles of roads and 53,452 miles of trails have been constructed. The construction of major roads, which is handled by the Bureau of Public Roads, has cost, on an average, \$14,368 per mile. The minor roads, constructed by the Forest Service, have cost \$1,327 per mile. During the fiscal year 1930 the cost per mile averaged \$26,121 for major construction and \$1,154 for minor construction. Trails to date have cost an average of \$171 per mile; for the past fiscal year they cost approximately \$141 per mile.

With all this construction, there remain 2,037 townships within the boundaries of the national forests in the Western States that are without roads of any kind. Idaho contains a larger number of such townships than any other State, 383; Montana contains 285.

At present \$12,500,000 is authorized annually for construction and maintenance of roads and trails included in the transportation systems planned for the national forests. Of this amount Congress has set aside \$9,500,000 for forest highways and \$3,000,000 for forest development roads and trails.

## Motor Equipment on the Big Springs Fire

By J. F. CAMPBELL, United States Forest Service

In fighting the Big Springs fire on the Deschutes National Forest, Oreg., in July, 1930, we gained some experience in the use of large equipment that should interest others who are responsible for fighting fire in country where it is possible to use motor equipment.

This fire originated and "blew up" on lands of the Shevlin-Hixon Lumber Co., about 1½ miles from the national forest boundary. The cover at this point was an almost pure stand of western yellow pine with an undergrowth of *Ceanothus* and bitter brush. At the time of the "blowup" the lumber company was using on the fire line a Fordson tractor, with treads operating somewhat like those on a caterpillar, and a Killifer plow. The Fordson was being operated on gentle slopes roughened by occasional outcroppings of lava rock. The machine would not work satisfactorily under such conditions, and was soon retired. Officials of the Shevlin-Hixon Co. then requested the Forest Service, which had offered to give any possible assistance but up to this time had taken no active part in the suppression work, to put its motor equipment to use. This equipment, consisting of a 2-ton caterpillar tractor and a Killifer wheel plow, had already been moved to the site of the fire and was put to use immediately.

The Killifer plow, in light soils, is capable of digging a furrow or trench about 20 inches wide and about 8 or 10 inches deep. It is fitted with a lever which will raise the plow blade above the soil surface so that solid rocks or logs may readily be passed over. Pine logs up to 8 inches in diameter are readily broken up by

the plow if solidly lodged against trees or other obstacles. To operate the outfit one man is required to drive the tractor and one to ride the plow for the purpose of holding it deep in the soil.

Between 7 p. m., when this equipment was first put into use, and midnight, 2½ miles of fire line was constructed and held with the support of an inadequate force of men. Electric headlights were used. The fact that this line held is attributed largely to the type of timber and to the fact that the line was built at night, when the fire was burning slowly. By 6 o'clock the following morning another 2½ miles of line had been constructed and held, with the same force.

On the second day the fire spread into rougher, brushy lodgepole country where the available forces were entirely inadequate to control it. Since the fire was spreading toward the national forest boundary, the lumber company requested the Forest Service to assist with administrative control. Immediately a camp was established and a start was made in rounding up men.

Meanwhile the caterpillar and Killifer were operated constantly and with all possible expedition. During the forenoon of the second day approximately 3 miles of trench was built. Fully one-half of this line was lost, not because of the quality of the work done with the motor equipment but because of the late start in collecting and organizing man-power to perform work that can not be done with machinery.

Not until the morning of the third day of the fire was a sufficient organization available to carry on effective suppression work. A second 2-ton caterpillar and plow had been moved in during the night, and enough men had been moved to the fire to form an organization that operated in the following manner: (1) Ten experienced axmen and fallers were dispatched to clear a right of way for the tractors. (2) The two tractors followed, one behind the other, the second widening the trench dug by the first. (3) A crew of 20 "swampers," most of whom were experienced fallers and axmen, following the tractors, widened the clearance and shoveled out inflammable material that had fallen into the trench. (4) Behind the "swampers" came a backfiring organization of 20 men, 7 of them equipped with Hauck torches and the remainder with shovels. The duty of this crew was to backfire and to hold the line until it could be taken over by the patrol force. (5) A patrol crew of about 100 men was so organized that each man was assigned a definite piece of line to take over immediately after the backfiring. On the third day of the fire this organization constructed and held between 4 and 5 miles of line, placing the fire under immediate control. This day's work was performed in comparatively rough country covered with a dense stand of lodgepole pine and white fir and with heavy underbrush.

Our experience in fighting this fire indicates that without adequate clearing, backfiring, and patrolling



crews the operation of tractors is a complete waste of time and energy. Moreover, men and horses are necessary to keep the tractors supplied with gasoline and oil. Tractors can be operated at this kind of work for only about 5 hours at one filling. Ordinarily, we have found, a crew of at least three packers is necessary for each machine.

Considerable difficulty was encountered in keeping brush from clogging the plow. It was necessary to stop frequently and clear the plow either by lifting it from the ground or by pulling the brush out by hand. Much valuable time was lost in this way. At the suggestion of Fred Brundage we have since developed a "gooseneck" which is attached to the plow. This "gooseneck" provides a greater clearance and allows the brush to pass freely without clogging. We have been able to improve our plows, also, by providing larger moldboards with more concave faces. A plow of this type makes a much more satisfactory trench and can be operated at higher speeds. Recent tests with the "gooseneck" and this special plow in dense stands of manzanita brush have given very satisfactory results.

An interesting illustration was afforded of the comparative value of a 2-ton caterpillar and a 60 caterpillar, when the Shevlin-Hixon Co. shipped one of the latter machines from its logging camp to the Big Springs fire. Behind this larger machine a heavy sawlog was chained and allowed to drag. A very satisfactory trench was built in this manner on the western yellow pine and cut-over land. A rock 36 inches in diameter likewise gave good results as a drag in this country. The heavier caterpillar was found to have a great advantage over the 2-ton machine because of its greater power and its ability to work on rougher ground. However, it consumes a great deal more fuel and requires much greater clearance in dense stands. It is much harder to move, also, than the smaller outfit.

Our 2-ton tractor and Killifer plow are transported on a 2-ton truck. Drills are held from time to time in loading and unloading this equipment. Our machines have been unloaded and put into operation in a period of six minutes.

## Timber Markets in Porto Rico

By W. P. KRAMER, United States Forest Service

Finding markets for forest products is not one of my problems as supervisor of the Luquillo National Forest, P. R. Within 10 miles of the forest boundaries are 11 municipalities having a total population of 172,142, which is a much greater number than the Luquillo, with its present area of 12,443 acres, could adequately supply with fuel wood, charcoal, and other forest products. As it now stands, moreover, the Luquillo is a protective rather than a productive forest. The precipitous slopes on which it is located must be clothed

permanently with a forest cover, and only a small part of its present commercial volume should ever be utilized. However, if the areas surrounding the present forest are purchased by the Government and planted to rapid-growing trees capable of producing fuel wood, construction timbers, and cabinet woods on short rotations, the Luquillo should yield considerable quantities of these products, which would at all times find a ready sale throughout the island. Many factors favor the intensive practice of forestry on an enlarged Luquillo on a profitable basis: There is a large population requiring a continuous fuel supply; domestic forest supplies are inadequate to meet the needs of the island's industries; general agriculture is greatly hampered for lack of a cheap local supply of wood; climatic conditions are highly favorable to rapid tree growth; utilization of all parts of the tree is complete; and labor is abundantly available at relatively low rates.

The native woods are preferred to imported woods for stakes, posts, ties, and construction timber of all kinds, because of their durability, although at present their scarcity makes it necessary to substitute imported pine, fir, and redwood. Although none of the native woods are satisfactory for the manufacture of box shooks for packing fruit and vegetables, two introduced species, African tulip (*Spathodea campanulata*) and Santo Dominican pine (*Pinus occidentalis*) are suitable for this use.

The existing forest resources of the whole of Porto Rico, which with its dependent islands has a gross area of only 3,435 square miles, would constitute not more than a 5-year supply for the island's present population of 1,543,913. The paucity of the domestic timber supplies is strikingly illustrated by the volume of the island's imports of forest products. In 1929 the people of Porto Rico, always poor and still further impoverished by the San Felipe hurricane of 1928, imported forest products costing \$4,517,850. (Of this amount all but \$64,810 represented imports from continental United States.) This was \$744,810 less than they had spent on forest-products imports in 1928. The difference was due largely to a sharp falling off in imports of box shooks, resulting from the hurricane's destruction of the citrus crops.

Immediately following the hurricane large quantities of down timber were manufactured into charcoal and dumped upon the market, resulting in a material decrease in prices. The retail price of three 5-gallon tins of charcoal on the San Juan and Rio Piedras markets dropped from 60 or 75 cents to 25 cents, from which point it has now risen to 35 cents. Previously, charcoal demand and prices had varied very slightly over a period of eight years. Prices on timber have not been reduced, although a considerable number of good timber trees were toppled by the storm. This is explained by the fact that whereas trees of the inferior species used in charcoal manufacture will rot if not manufactured promptly after they are felled, the valu-



able timber used in construction work and for bull carts, piling, furniture, etc., remains salable for years after felling if it is kept in a dry state. The overstocked condition of the charcoal market will probably prevail for another year or 18 months. A great many damaged trees of charcoal species are still standing or are leaning or lying over each other, and will thus last for a much longer period than if they were in contact with the soil. Another basic reason for low charcoal prices continuing over a long period of time is the fact that for many generations the *jibaro*, or mountain laborer, has been accustomed to cutting wood and making charcoal for sale wherever he needed a few extra pennies. Facing hard times for the next few years, he will be found making and selling charcoal in order to eke out a living.

### Planted Yellow Poplars Yield to Sprouts on Ohio Hardwood Area

Yellow poplar has failed in competition with sprout growth of native hardwoods on an area in southern Ohio where it was planted in 1928, two years after clear cutting of the second-growth timber and immediately after the burning of the brush and of the young volunteer stand. The test was made by foresters of the Central States Forest Experiment Station and the Mead Pulp & Paper Co.'s forester, K. A. Swenning, on 10 acres of that company's property in northeastern Pike County. The soil is of medium depth, excessively drained but, according to the composition of the second-growth stand, moist enough to grow yellow poplar. A stump tally on the area showed that the second-growth stand had consisted chiefly of white ash, black oak, bitternut hickory, white oak, mockernut hickory, black locust, and black walnut. The burning, on April 5, 1928, killed all sprout growth and consumed most of it.

Sprouting has been more vigorous since the burning than it was in the two years that followed the cutting. The third season found the poplars completely overtopped by a vigorous growth of sprouts in which black locust predominated. Slippery elm was especially prevalent. On a sample plot of one-half acre 55 poplars had survived out of about 500 planted. Sprouts of good tree species on the half acre numbered 1,024. The average height of the poplar was 2.1 feet, as compared with an average height of 11.8 feet for black locust. All the poplars were spindling and lacked vigor, so that it appeared useless to attempt to release them by cutting back competing sprouts.

Less vigorous sprouting could be expected after the cutting of old-growth hardwoods of the same species than occurred in this instance after the cutting of second-growth timber, and the 2-year delay that occurred between cutting and burning accounts in part for the great number of seedling sprouts.

### Effect of Composition on Yield of Conifer Stands in the Sierras

By L. H. REINEKE, United States Forest Service

In even-aged, second-growth stands of mixed conifers in the California Sierras, constituents of which are western yellow pine, sugar pine, Douglas fir, white fir, and incense cedar, the presence of a greater than average proportion of western yellow pine and sugar pine tends to make the yield greater than the average, and a greater than average proportion of Douglas fir tends toward yields below the average. These conclusions are based on a detailed analysis of data from 225 sample plots measured by Duncan Dunning, of the California Forest Experiment Station, and others. On these plots the five species were mixed in many different proportions.

The ages of the stands measured ranged from 45 to 90 years, but in most cases were between 45 and 60 years. Average yield, as indicated by total basal area, was first determined, and departures from this average were correlated with the proportions in which individual species were present. The following table indicates the average composition of various types in which one or two of the conifer species of the Sierras predominate, and shows the yield, in percentage of average yield, for stands 50 to 60 years old on sites of average quality.

Type	Percentage of total basal area represented by—					Yield, in percentage of average yield
	Western yellow pine	Sugar pine	Douglas fir	White fir	Incense cedar	
Sugar pine.....	10.3	59.2	6.4	9.6	14.5	113
Western yellow pine.....	76.9	3.0	5.4	5.3	9.4	111
Western yellow pine-sugar pine.....	39.2	36.8	3.6	9.6	10.8	110
Western yellow pine-white fir.....	40.0	3.5	8.7	34.3	13.5	105
Sugar pine-white fir.....	1.2	28.5	3.5	62.0	4.8	103
White fir.....	2.7	2.9	10.0	81.2	3.2	102
Douglas fir-white fir.....	7.5	3.1	44.5	43.2	1.7	96
Douglas fir.....	8.8	2.8	78.9	8.6	.9	88
Average, all plots.....	24.8	8.2	36.1	24.7	6.4	100

The yield of stands with high percentages of sugar pine and western yellow pine is shown to be 10 to 13 per cent above the average for all the types represented in the table; that of stands high in white fir is about average, and that of pure Douglas fir stands is 12 per cent below average. For the compositions shown the range in yield is from 113 per cent to 88 per cent of the average. For stands composed 100 per cent of western

yellow pine and stands composed 100 per cent of Douglas fir the yields would be 123 per cent and 75 per cent, respectively, of the average.

## National Forest Receipts

Net receipts from the national forests in the fiscal year ending June 30, 1930, were \$6,752,045, the largest in Forest Service history, exceeding the receipts of 1929 by \$452,000. Timber sales brought in \$281,000 more, and grazing \$203,000 more, than in the preceding year. National forest receipts for the first quarter of the fiscal year 1931 were \$1,197,831, which falls short by nearly 24½ per cent of matching receipts for the same period of last year.

## Changes Approved in Forest Service Nomenclature

By W. A. DAYTON, United States Forest Service

On September 26, 1930, announcement was made that the Forester had approved 36 changes in Forest Service nomenclature as standardized by the Check List of the Forest Trees of the United States: Their Names and Ranges (Department of Agriculture Miscellaneous Circular 92, published in 1927). The purpose of the changes was to harmonize Forest Service nomenclature with that of the Bureau of Plant Industry and other bureaus of the Department of Agriculture. None of the species involved are of more than secondary importance as timber; most of them are usually shrubs or, at most, small trees.

The 18 changes in Latin nomenclature (mostly minor) include 3 made in conformity to the rule of priority, 1 which rejects a homonym, 10 recognizing as species forms which the check list held to be subspecies, 1 recognizing as a genus a group which the check list held to be of subgeneric rank, and 3 which distinguish native western United States plants from related eastern or Mexican species. Of the changes in English nomenclature several affect misnomers or indefinite names (as horsebean for a kind of paloverde, and frijolito for the mescalbean) and names that were ambiguous as applied to shrubby congeners of the arborescent species with which they are identified (as mountain willow for *Salix scouleriana*, and Texas paloverde for *Cercidium floridum*). Madroño has been Anglicized to madrone; Rocky Mountain shin oak has been changed for the sake of brevity to wayleaf oak; hackberry has been made more definite by adding the prefix Douglas; Oregon myrtle has been discarded in favor of the more accurate California-laurel as a common name for *Umbellularia californica*; and flannelbush has been adopted as in better popular usage than mountain leatherwood for *Fremontodendron*.

Copies of the announcement listing the changes may be procured by application to the Forest Service, Washington, D. C.

## Standardizing Range Plant Names for the Forest Service

By W. A. DAYTON, United States Forest Service

Since 1907 the Forest Service has been collecting and preserving carefully annotated range plant specimens and analyzing data in regard to them. This project is fundamentally related to the administration of national forest range areas and to research in range management; as ecological concepts become more widely accepted in forestry it is more and more appreciated as having significance in connection with silvical research and with forestry generally.

Anyone who has not made a first-hand study of the vegetation present on the national forests would hardly credit its complexity. It comprises many thousands of species, of widely varying habits, requirements, and properties, a surprisingly large number of which have practical significance. Relatively few of the range plants are covered in the two currently accepted American nomenclatural guides, Sudworth's Check List, which deals ostensibly with forest trees only, and Standardized Plant Names, which purports to cover horticultural plants only. To standardize the nomenclature of national forest range plants has therefore been a real problem.

Although the value of stability and uniformity in plant nomenclature is generally recognized, in my opinion relatively few fully recognize the fact that proper nomenclature is essentially a research problem and is necessarily an objective rather than a fait accompli; that there never was and never can be a czar in science; that any individual, skilled or unskilled, anywhere, at any time, in any language or dialect, may publish a new plant species or genus that will affect botanical nomenclature for all time; that, save for a relatively few splendid exceptions, the published floras of American States and regions are woefully lacking in nomenclatural coordination; that many leading systematists regard English plant nomenclature or attempts at its standardization with apathy, if not with derision; that a man studying the nomenclature of trees ought not to forget shrub and herb nomenclature, and the writer of a State or regional flora should not ignore the floras of other States or regions, the flora of the country as a whole, or allied floras of other countries; that a great volume of tedious, thankless, time-consuming work must be done by persons possessing a broad field as well as closet knowledge of plants, together with a knowledge of languages and of botanical history and literature, before English plant nomenclatural standardization worthy of the name can be attained.

Authority for the Latin nomenclature in Forest Service range plant studies resides in the staff of admirable systematists working under the immediate supervision of Frederick V. Coville, of the Bureau of Plant Industry, one of the most eminent of American botanists. Doctor Coville is recognized, also, as the De-

partment of Agriculture's outstanding authority on English plant nomenclature.

As a result of the efforts of the Forest Service Division of Range Research to iron out discrepancies in English range plant nomenclature and to lay a framework for eventual standardization of the common names of the numerous plants with which it deals, a booklet of notes on range grasses was printed in 1914, and a preliminary check list of common or vernacular names of national forest range plants was issued in typewritten form in 1919. In 1929 the Forest Service organization in region 4 (the intermountain region) issued a printed list of standard names of the more important range plants of that region. Results of the cooperative efforts of Doctor Coville and myself toward standardization of the English nomenclature of western range plants have been shown from time to time in various publications by other writers, will undoubtedly affect the 1933 edition of *Standardized Plant Names*, and may also, eventually, result in a published check list.

In selecting an English name for a given plant consideration should be given to usage, appropriateness, individuality (i. e., avoidance of ambiguity), botanical relationships, brevity, euphony and taste, and visual qualities of the name form itself. In such work the division of range research has had recourse to the literature of the subject, to Forest Service records (including correspondence, annotations accompanying specimens, etc.), and to personal experience, as well as to cooperation with outside agencies. When the need arises for fitting an acceptable English name to an unnamed or untenably named genus or species we have had recourse to three expedients: (1) Anglicization of the technical name, resulting in such names as *angelica*, *bistort*, *collomia*, and *eupatory*; (2) more or less free translation of the Latin or Greco-Latin name (e. g., starleaf for *Astrophyllum*, pitchfork-weed for *Dieranacarpus*, sweetvetch for *Hedysarum*, longtube for *Macrosiphonia*, blackfoot for *Melampodium*, and wolfberry for *Lycium*; and (3) invention, which is especially invited when the plant has a striking quality or an unwieldy Latin name or both (e. g., white brittlebush for *Encelia farinosa*, fendlerbush for *Fendlera*, and summit willow for *Salix saximontana*).

In suggesting English plant names it is well to follow the principles set forth in the preface to *Standardized Plant Names*. An additional principle requires that some such word as "little," "small," or "pygmy" be used in preference to "dwarf" for small species, "dwarf" being a horticultural term applicable to a diminutive form or state of any species. The term "common," also, should be avoided so far as possible. This term is essentially illogical as a species name, its use frequently giving rise to the anomaly of the rarest plant in a given locality being referred to as "common."

## Western Tree Seed Crops of 1930

The cone crop of 1930 on national forests of the Pacific Northwest is good for most species, and for Douglas fir is the best since 1923. In California, national forest officers report an abundance of incense cedar and California red fir seed, a very heavy crop of mountain hemlock seed especially at the timber line, and a medium crop of sugar pine and western white pine seed. The white fir seed crop in California is reported missing.

Seed production of conifers in the northern Rocky Mountain region was poorer in 1930 than in any other year since the Forest Service began to make phenological observations there about 20 years ago, according to a report by Assistant Silviculturist Jacob Roeser, jr. The Douglas fir seed crop was a complete failure above an elevation of about 8,500 feet, as a result of killing spring frosts. At lower elevations it was greatly reduced as a result of wet weather. The Engelmann spruce cone crop was likewise deficient. For some reason this was an off year for spruce seed, very few flowers developing. In the Pikes Peak region the western yellow pine seed crop failed completely.

## Mount Whitney Trail Opened

A foot and horseback trail to the summit of Mount Whitney, Calif., was officially opened to public use September 5. With its 14,496-foot elevation this summit is the highest point in continental United States. Mount Whitney stands on the boundary between the Inyo National Forest and the Sequoia National Park. The trail starts at the mouth of Lone Pine Canyon, near Lone Pine, Calif., in the Owens Valley, and runs for some 12 miles through the Inyo National Forest to the summit of the Sierra Nevada, then crosses into the Sequoia National Park and continues several miles to the summit. By this route the trip from Lone Pine to Mount Whitney and back can easily be made on horseback in one and one-half days. The trail was constructed by the Government at a cost of \$25,000.



National forest area figures as of June 30, 1930, show a decrease of 589,023 acres in gross area and an increase of 340,297 acres in net area. Eliminations aggregated 964,725 acres; additions, 401,080. Land exchanges resulted in a net gain of 190,576 acres, and purchases totaled 417,064 acres.



Cone pickers working on the Lassen National Forest, Calif., between the 1st and 15th of September collected 8,200 pounds of Jeffrey pine and 6,500 pounds of western yellow pine cones. The Forest Service paid 1½ cents a pound for all first-class cones. The seed will be used in the nursery maintained by the service at Susanville, Calif.

# General Forest News

## Committee Studies Diseases of Wild Animals

By C. E. RACHFORD, United States Forest Service

For many years observations on the condition of our wild life have pointed to considerable prevalence of disease among game and other wild animals. From time to time we have had examinations of wild animals made, and the results have proved conclusively that disease of one form or another was largely responsible for the low increase or gradual depletion of certain herds. The need for study of the whole situation in regard to wild-animal diseases and for development of practical means of control has led to the formation of a committee consisting of representatives of the Bureau of Animal Industry, the Bureau of Biological Survey, the National Park Service, and the Forest Service. Maurice C. Hall, principal zoologist of the Bureau of Animal Industry, is chairman.

At the first meeting of this committee, on October 10, Doctor Hall indicated his belief that as the wild animals are concentrating on smaller and smaller areas they are becoming affected by an increase in parasites such as overcrowded conditions produce in the case of domestic animals. Doctor Hall discussed recent studies of the diseases of elk, especially ticks. It was brought out that investigations of scabies among Rocky Mountain sheep and elk have been inadequate to determine whether or not the disease is communicable from mountain sheep to domestic sheep or vice versa.

Doctor Hall indicated that in an investigation on one of the national forests deer showed a surprisingly large percentage of cases of cysticercosis of the liver caused by a bladder worm commonly called *Cysticercus tenuicollis*, a larval form of one of the dog tapeworms, *Taenia hydatigena*. This worm occurs in the mesenteries of the deer as a fully formed tapeworm. In an investigation by W. T. Huffman, of the Field Inspection Division, Bureau of Animal Industry, and Doctor Hall, it was assumed that the coyote was the important carrier of the adult tapeworm responsible for this cysticercosis in deer. Post-mortem examination of three coyotes killed on the forest showed one to be a carrier. These coyotes were all young, and it is probable that the worms are harbored by a much larger percentage of adult coyotes. Control, for the present, is a matter of keeping down the coyote population by killing. These deer also harbor a larval tapeworm in the heart, and this tapeworm develops to an adult in various wild carnivores. Here also, control is a matter of keeping down the carnivores.

In the past two years numerous cases of lungworms in Rocky Mountain sheep, deer, and other wild ruminants, associated at times with the deaths of these animals, have come to the attention of the Bureau of Animal Industry. In most of these cases, though not in all, Gerard Dikmans, of the zoological division, has found the worm to be a very fine red worm known as *Muellerius capillaris*.

A species of lungworm closely related to *M. capillaris* was present in Rocky Mountain sheep dying in Colorado. An investigation by Doctor Hall brought to light certain facts which seemed to point to an interesting hypothesis. The sick sheep had a cough, presumably associated with the lungworms, but in addition they were barely able to walk away from an observer and walked as if weak in the hindquarters. There was evidence that these sheep had been eating the bones of old carcasses. This brought to Doctor Hall's mind the work of Sir Arnold Theiler in South Africa showing that lameness in cattle was associated with a toxic condition due to toxins produced by anaerobic bacteria in old bones, and that cattle ate these bones because they were suffering from the effects of a mineral deficiency in their diet. Somewhat similar conditions have been found on national forest ranges where domestic livestock were obtaining an inadequate quantity of mineral salts.

In the rearing of quail for stocking there has been much trouble from coccidiosis. Investigations on this problem have been conducted by Herbert Stoddard, of the Biological Survey, and E. B. Cram, of the Bureau of Animal Industry, and others are under way in different parts of the country.

One of the most interesting discoveries reported at the meeting was the tapeworm infestation in trout in the Yellowstone Lake. Parasitologists ascertained that a certain larval tapeworm occurring in the viscera and flesh of the cut-throat trout would develop to an adult tapeworm, *Dibothrium cordiceps*, in the intestine of the white pelican when infested trout were eaten by the pelican. Trout in turn became infested indirectly from the tapeworm eggs in pelican droppings deposited in water. This parasite appears to be present in Wyoming, Montana, Idaho, and Oregon, and probably is present in other States.

Hemorrhagic septicemia has been found to be present in deer and antelope, and investigations have strongly indicated its presence in other game animals. Game reports from forest officers are replete with observations suggesting still other maladies among our wild animals.

It is clear that all animals captured for restocking purposes should be carefully inspected by competent authorities before they are transplanted.

The committee on diseases of wild animals proposes to make a preliminary survey of the results of all investigations that have been made in its field in the United States and then to develop a program of research. Field officers have been requested to submit information to be presented to the committee at its next meeting in December.

## Predacious Beetle Introduced in Northwest in Effort to Control Tussock Moth

Two shipments of the European ground beetle (*Calosoma sycophanta* L.) were sent across the continent from Massachusetts in June of this year to be liberated in a tussock-moth infested stand of Douglas fir and lowland white fir near Northport, Wash. They were sent from the Gipsy Moth Laboratory at Melrose Highlands, Mass. Of the 1,200 beetles shipped 1,004 survived the trip. If this insect can withstand the rigorous climate of northeastern Washington it is hoped that, with a few more shipments, it will multiply so as to become an important factor in the control of the Douglas fir tussock moth (*Hemorocampa pseudotsugata* MacD.), which has been doing a great deal of damage in the Northport region.

*Calosoma sycophanta* is a beautiful green-gold beetle averaging slightly more than an inch in length. Although it is called a ground beetle, both the adult and immature forms will climb trees in search of their prey, which consists principally of caterpillars. In Europe, where it is native, the beetle preys on the gipsy, brown-tail, and nun moths and on the European pine sawfly. It was first introduced in this country in 1905 to help control the outbreak of the gipsy moth in Massachusetts.

This is the first instance in which the Forest Insects Division of the Bureau of Entomology has attempted to control an outbreak of a forest pest in a western State by introducing a predator.



The western bark beetle laboratory maintained by the United States Bureau of Entomology at Stanford University, California, has been moved to the University of California, at Berkeley. Laboratory and office space has been allotted to J. M. Miller, senior entomologist in charge, and his staff in the new Giannini Hall, which houses the university's department of forestry and the California Forest Experiment Station.

## Slash Decay on Forests of the Southeast

Excessive drought appears to have held slash decay at a standstill this year on a coastal plain forest near Franklin, Va., visited by Perley Spaulding, forest pathologist of the United States Bureau of Plant Industry. Examined in October, both hardwood and loblolly pine slash of last winter's cutting was found to be practically sound. Normally, it appeared, sap rot would have been well begun. From examination of older slash Doctor Spaulding concluded that in this vicinity the presence of logging slash does not usually involve extreme danger of forest fire for as long as three years; by the third year the leaves, twigs, and smaller branches are well rotted and have largely fallen to the ground. Since decay is so rapid, it does not seem to him that lopping of the slash could very materially hasten the passing of the extreme danger point. Another reason for questioning the efficiency of lopping as a decay-hastening measure on such a forest is the apparent prevalence of waterlogging.

On chestnut and mixed hardwood areas on the Pisgah National Forest, N. C., Doctor Spaulding found evidence that in most places on these areas the extreme danger of slash fire passes in three years. That period suffices for the rotting and disappearance of leaves, dead twigs, and branches less than an inch in diameter of all the timber species most numerous in the stand. Here slash is not usually dense, and in most cuttings some shade is left. The best timber and the densest slash are on the cooler and more moist slopes. In this situation it does not seem that lopping of slash can decidedly shorten the already short rotting period, and it may lead to waterlogging. On warmer and drier slopes lopping may hasten decay without waterlogging, but at a rather high cost. There is danger, also, that if fire occurs lopped slash will intensify the damage by concentrating the fire near the ground.

## Long-Bell Co. Collects Tree Seed of Many Species in Many States

One or two portable seed-extraction plants are to be developed by the Long-Bell Lumber Co. for use in the Northwest, supplementing the company's permanent plant at Longview in which are handled seed of all the important forest tree species of Oregon, Washington, British Columbia, and Alaska. An extraction plant that can be moved from one center of cone occurrence to another will make it less difficult to obtain, in any given year, seed from the best types of forests producing seed in that year. Seed of western yellow pine, sugar pine, incense cedar, the true firs of the Sierras, and other conifers native to northern California and southern Oregon are extracted by sun

drying at the Long-Bell nursery plant at Tennant, Calif. Southern pine seed collected by Long-Bell employees in Georgia, Louisiana, Arkansas, and Texas are extracted at a plant at Ludington, La. For all the seed it handles the Long-Bell Co. records the source and climatic conditions at source, thus enabling the purchaser to select seed that originated on a site comparable to the site on which he desires to plant.

## Northern Great Plains Station Cooperates in Thousands of Shelter-Belt Plantings

By ERNEST J. GEORGE, United States Bureau of Plant Industry

In semiarid sections of North and South Dakota, Montana, and Wyoming 3,207 farmers have established shelter belts with the cooperation of the Northern Great Plains Field Station, maintained by the United States Department of Agriculture at Mandan, N. Dak. Each of the shelter belts was established on a farm where irrigation was not practiced. The station has been cooperating in this work since 1916. In supplying a farmer with the planting stock, planting plans, and advice required it has sought not merely to benefit him individually but, with his cooperation, to show neighboring farmers what results may be expected when shelter-belt plantings are correctly made and cared for on farms such as theirs. For this reason the 200 to 300 plantings in which the station cooperates each year are scattered over the 112 counties which it serves; five is the largest number established in any county in any one year. Usually it is necessary to choose among 400 or 500 applications. Some representative of the station visits each applicant to determine whether the land on which it is desired to establish a shelter belt is in a good state of summer fallow and, if it is, to gather the data necessary for preparing a planting plan.

The 3,172,940 trees which the station has distributed for shelter-belt planting in the past 15 years were all grown in its own nursery. The hardwoods were produced from seed collected locally. Conifers growing at the station have now begun to produce cones, and in the future are expected to yield most of the conifer seed required. The hardwoods used are "Northwest poplar" (*populus* sp.), boxelder, green ash, Russian-olive, Chinese elm, American elm, and caragana. Conifers used are western white spruce (*Picea glauca albertiana*, known to horticulturists as Alberta spruce or Black Hills spruce), blue spruce, jack pine, Scotch pine, and western yellow pine. Hardwoods are shipped as 1-year or 2-year seedlings from 15 to 36 inches in height; pines are shipped as 2 2 year transplants and spruce as 2-3 year transplants.

In general not more than 1,000 trees are furnished for an individual planting. Plantings are of sufficient length to give farmsteads, gardens, or orchards suitable protection from winter winds and drifting snow. In

width they vary from 2 to 12 rows. Conifers are not usually furnished until the hardwood planting is 2 or 3 years old. They are then used in making an addition on the lee side of the hardwood planting. Because of the difficulty of growing conifer stock under dry-land conditions, only enough conifers are furnished to each farmer to plant two or three rows.

Usually from 80 to 95 per cent of the hardwoods planted survive to the first fall after planting. The survival of conifers varies from complete failure in unfavorable years to 85 per cent in years when conditions are more favorable.

In an effort to determine how far apart trees should be planted in the shelter belts to make the most satisfactory growth and maintain sufficient crown density to break the force of wind and snow and develop shade that will prevent excessive growth of grass and weeds, various spacings have been tried out in these demonstration plantings. The spacing was 4 by 8 feet in plantings of 1916-1919, 6 by 6 feet in 1920 and 1921, 6 by 8 feet in 1922, 6 by 10 feet in 1923-1926, and 6 by 12 feet in 1927-1930.

In 76 counties included in the area served by the Northern Great Plains Station the station deals with farmers through county agricultural agents. Cooperators are chosen by the county auditors in two counties, and in one county each this service is performed by a district home demonstration agent, a Smith-Hughes instructor, and a railway agricultural agent. In the other counties applicants deal directly with the station.

Preparations are now being made to send out about 200,000 trees of hardwood species to 300 farmers for planting new demonstration shelter belts in the spring of 1931. About 15,000 coniferous transplants also will be ready to be shipped next spring for making additions to established shelter-belt plantings.



Nine additional seats of blister-rust infection were discovered in the western white pine belt of northern Idaho during the summer of 1930. Most of the newly discovered infections were identified as having originated in 1927; several are believed to date from 1923. Points in northern Idaho at which the rust has been discovered on pine now total 13.



The grazing of goats on a fenced area of loblolly pine forest belonging to the Camp Manufacturing Co., Franklin, Va., has resulted in the establishment of a dense stand of loblolly pine reproduction free of any intermixture of hardwoods. On a similar adjoining area that has not been grazed red gum and other hardwoods, chiefly unmerchantable, form a fairly complete understory beneath the loblolly pine and stand ready to take possession of the site when the mature timber is cut, excluding the possibility of loblolly pine reproduction.



## International Body Will Endeavor to Correlate Forest Research Practices

The permanent committee of the International Union of Forest Research Organizations (formerly the International Union of Forest Experiment Stations) at a meeting held July 15-16 appointed a committee on correlation of silvicultural research practices. At the next meeting of the union, to be held in 1932 in Nancy, France, it is proposed to have methods used in various countries presented with a view to bringing about the use of uniform technique and comparable measurements. This would make it possible to report results of research in standard terms. The members of the committee on correlation are Mark L. Anderson, research officer for Scotland, Great Britain Forestry Commission; Yrjö Ilvessalo, professor of silviculture, Forest Research Institute, Helsinki, Finland; W. Jedlinski, professor of forest management, Superior School of Agriculture and Forestry, Warsaw, Poland; E. Wiedemann, director, Prussian Forest Experiment Station, Eberswalde, Germany; M. Oudin, chief inspector of forests and waters, Nancy, France; N. Kobranoff, Forest Research Institute, Leningrad, Union of Socialist Soviet Republics; E. N. Munns, Chief, Division of Silvics, United States Forest Service; and H. Petterson, director, section of silviculture, Swedish Forest Experiment Institute.

## Pan-American Agriculturists Meet to Plan Cooperation

In fulfillment of a resolution approved by the Sixth International Conference of American Republics, held at Habana in 1928, an Inter-American Conference on Agriculture, Forestry, and Animal Industry was held September 6-20, 1930, in Washington, D. C. The governing board of the Pan American Union were hosts to the conference. Sixteen of the twenty-one countries making up the membership of the union were represented by 55 official delegates and by about 175 consulting experts.

The purpose of the meeting was to pave the way for inter-American cooperation in meeting problems in its field. The conference aimed first to define outstanding problems which seem to invite cooperative treatment, then to discuss policies and methods for dealing cooperatively with these problems. The topics discussed fell into four main groups: Research in agriculture and forestry, agricultural economics, plant and animal diseases and pests, and commodity production. Forestry was the chief subject of discussion during the sessions of the second and third days.

The governing board of the Pan American Union intends to sponsor a series of inter-American conferences of this nature. One of the resolutions of the 1930 conference calls for a second conference within five years, and another suggests that before the next inter-

national conference a national congress on agriculture, forestry, and animal industry be held in each member country.

It was resolved that governmental and private agricultural agencies throughout the Americas send to the division of agricultural cooperation, Pan American Union, all available bibliographical data on agriculture, forestry, and animal industry, thus enabling the division to compile a continental bibliography and special bibliographies on these subjects. The conference expressed a desire that the activities of the division of agricultural cooperation be extended to include the assembling of statistical material, and that with the division as intermediary an exchange of publications be arranged among scientific institutions in the Americas dealing with agriculture, forestry, and animal industry. It was requested that the Pan American Union use its influence to unite Latin American scientific workers in an association similar to the American Association for the Advancement of Science.

In resolutions dealing solely with forestry the conference recommended that the countries of the American Continent undertake forest surveys to determine the location and area of forests, classifying them according to species, merchantable volume by species, productive capacity of each forest type, and rate of depletion; that studies be made of the characteristics and ecological behavior of the various species of forest trees and of the various types of forests in all the Latin-American countries; that the attention of the various governments represented in the Pan American Union be called to the advantages of performing forest exploitation in a rational manner, and of giving special attention to reforestation needs and to protection against erosion and floods; that countries not having already done so take steps to prevent destruction of forests through exploitation of secondary products; that each country investigate the technical properties and methods of utilization of all species occurring in its forests in commercial quantities; that plans be formulated under the general guidance of the Pan American Union or by a special international committee for systematic testing of American woods; and that countries having carried out experiments in the utilization of waste matter resulting from forest exploitation communicate the results to other countries of the continent. It recommended that efforts be made to standardize the forestry terminology of the American Continent, and that the nations of Latin America introduce the teaching of forestry into their programs of agricultural education and even of normal, secondary, and primary education, as a means of bringing about the conservation of forests. The matter of establishing institutes for forest research was commended to the governments of the member nations for study.

For the future the name of the conference has been shortened to Inter-American Conference on Agriculture, on the basis that agriculture includes both forestry and animal industry.



## Early Observations on Soil Wastage in Mississippi

By J. D. SINCLAIR, United States Forest Service

There is a general impression that most of the deep gullies in the uplands of Mississippi date from the period of land abandonment following the Civil War. Some of the few remaining old settlers in their tales of antebellum days refer to the cleared lands as being entirely in cotton or corn and cultivated with slave labor until they resembled large gardens. A Preliminary Report on the Geology and Agriculture of the State of Mississippi, by State Geologist L. Harper, published in 1857, indicates that even at that date soil erosion was a problem of no small proportions. Some excerpts from Doctor Harper's report are as follows:

I intend, by no means, to indicate that our agriculture does not provide for our wants. It does much more than that. Our Indian corn, our wheat, our flour, is exported to all parts of the world, and our cotton clothes the whole civilized world; but we gain those articles *too much at the expense of our soil, not of our labor and industry.* Our agriculture is not a correct, a natural, and scientific one. We exhaust our lands, abandon them, and resort to others; we remedy, by the abundance of our lands, what we ought to prevent by our skill and science, and, after a longer continuation of such an agriculture, our States must be exhausted, and their inhabitants reduced to poverty.

The territory of the carboniferous formation, the eastern portion of Tishomingo County, is generally hilly, too much so for agriculture; it has a great deal of poor sandy land, entirely formed from the sand strata of the orange sand group, which overlies it nearly everywhere, and in most places very thickly. The growth of forest trees of these lands consists principally of pine trees (*Pinus rigida*), and black jack (*Quercus*

*nigra*), as soon as the timber is cut down, the soil is washed off from the slopes of the hills, and the land becomes very poor.

The eocene rocks can be divided into a cretaceous and an aluminous group; the aluminous group consists mostly of most excellent marl beds, which can not fail to have the most salutary influence upon the agriculture of the State.

This agriculture has hitherto been a very exhausting one. Mississippi is a new State; it dates its existence only from the year 1818; and notwithstanding all its fertility, a large part of the land is already exhausted; the State is full of old deserted fields. It is, then, a most fortunate circumstance, that nature has so kindly provided for the refertilization of those exhausted fields, and that the highest authorities of the State made such careful and prudent arrangements to open those resources at once.

The loess, or bluff formation, forms a most excellent soil; decidedly one of the most fertile in the State; its territory was, therefore, selected for the first settlements in the State. But it is remarkable, *a careless and unnatural agriculture has so completely worn out a part of this fertile soil, that it does no more effervesce with acids;* the continual cultivation in cotton has exhausted the lime nearly completely. Fresh soil, of the same field, where it had not been cultivated on account of declivity, and of another place, which had been worn out, were tested; the first effervesced strongly, the latter not at all.



L. W. Baldwin, president of the Missouri-Pacific Railroad, who is chairman of the Missouri Drought Relief Committee, has suggested to railroad executives the desirability of making purchases of railroad ties during the next few months, to fill prospective needs, as a measure for the relief of farmers.

## Foreign Notes

### Forest Research Program Under Way in British Columbia

British Columbia's Forest Research Division, organized since the war, now has silvicultural studies in progress at two forest experiment stations and is developing a third station for nursery and planting experiments. Its Douglas fir studies center in a station at Cowichan Lake, on the southern portion of Vancouver Island, consisting of about 400 acres of forested land and three permanent buildings. A good variety of forest types can be reached from this station in an hour's time or less. In the surrounding district logging has been going on for more than 30 years. Studies of spruce regeneration, supplemented by experimental cuttings, are being conducted at a station at Aleza Lake, where permanent headquarters and residence buildings have been completed. For nursery

and planting experiments the division has chosen 600 acres of cut-over land, on a very good fir-hemlock-spruce site, along the highway between Vancouver and Seattle. The nursery is to occupy about 20 acres near the center of this block, and will be surrounded with experimental and demonstration plantings. At present it contains about 140 beds of 1 and 2 year old stock. A 40-acre planting of fir and spruce was made in the spring of 1930. In about five years' time the division expects to be planting 2,000,000 trees annually.

The division's permanent staff, which is headed by P. M. Barr, consists of seven technical men and a foreman.



The Quebec government has offered to accept half the usual stumpage dues for burned timber cut before March 31, 1931. The object is to reduce unemployment in woods operations.

## Canadian Pulp and Paper Production in 1929

Canada's pulp and paper manufacturing industry, which leads all others in the Dominion both as to value of product and as to wages and salaries distributed, again increased its output in 1929. In that year Canadian mills produced 4,021,229 tons of wood pulp, valued at \$129,033,154. In 1928 they had produced 3,608,045 tons valued at \$121,184,214. Paper produced during the year totaled 3,197,149 tons and was valued at \$193,193,022, an increase of 12.2 per cent in quantity and 4.8 per cent in value. The net value of production of the pulp and paper mills increased by more than \$2,500,000 to total \$147,096,012. The value of pulpwood and pulp exported and the gross value of paper products amounted to \$249,227,136, an increase of 1.6 per cent over 1928. Employees in pulp and paper mills in 1929 numbered 33,584, and the total pay roll was \$50,214,445. There were 108 pulp and paper mills in operation during the year, of which 34 made pulp only, 28 made paper only, and 46 made both pulp and paper.

Newsprint made up 85.2 per cent of the total reported tonnage of paper manufactured, amounting to 2,725,331 tons valued at \$150,800,157. This was an increase over the preceding year of 12.9 per cent in tonnage and 4.6 per cent in value.

The apparent total production of pulpwood in 1929 was 6,573,417 cords valued at \$76,415,876. About 80.3 per cent of this wood was manufactured into pulp in Canadian mills.

Exports of wood pulp from Canada during 1929 amounted to 835,710 tons valued at \$43,577,021, as compared with 863,805 tons, valued at \$45,614,823, in 1928. Exports of paper and paper goods were valued at \$154,710,085, as compared with \$147,156,792 in 1928. They included 2,510,633 tons of newsprint valued at \$148,710,085.

## Canadians Experiment in Girdling Hardwoods to Release Conifers

A study of the effect of girdling hardwoods to release conifers has been begun at the Lake Edward Forest Experiment Station, Quebec, in a stand composed largely of mature maple and birch with an understory of young spruce and balsam fir. The girdling was done in 1922. On one 1-acre plot (B) 40 per cent of the mature hardwoods were girdled; on another (C), all the mature hardwoods were girdled. A control plot (A) of one-half acre was established. Reporting on an examination made in 1928 W. M. Robertson states in the June, 1930, *Forestry Chronicle* that in the first six years after the girdling the net increment of the conifers was 121 cubic feet on plot A, 156 cubic feet on plot B, and 170 cubic feet on plot C. The annual

increment during that period averaged 4.2 per cent on plot A, 5.6 per cent on plot B, and 5.2 per cent on plot C.

## Eberswalde Forest School Celebrates Centenary

The Eberswalde Forest School, in Prussia, Germany, celebrated this year its hundredth anniversary. Three days of meetings and festivities, beginning August 1, were attended by 350 or more German foresters and by representatives from Sweden, Finland, Hungary, and the United States. Prof. R. R. Fenska, of the New York State College of Forestry, was present and describes an exceptionally felicitous occasion. The speakers accorded special recognition to Professor Schwappach and to the late Professor Wiebeke, remembered for his pioneer work in developing tree seed extraction technique. A part of the exercises was the dedication of a new forest products and soil science building completely equipped for research in those subjects. Another feature was a trip to near-by forests. An excellent male choir of 50 furnished music. There was a banquet with no after-dinner speeches, a play, and a grand ball.

## Turpentine in the Dutch East Indies

The faces chipped on *Pinus merkusii* in the naval-stores operations of the Netherland East India Government are about 4 inches wide and about 1 inch deep, according to information received from Coert du Bois, American consul general at Batavia, who was formerly a member of the United States Forest Service. Trees 12½ to 19 inches in diameter are tapped on 1 face; larger trees up to 25 inches in diameter, on 2 faces; and those still larger, on 3 faces. The faces are re-opened every three days with a wide, shallow carpenter's gouge chisel. In 1927, a year during which the diversion of labor to building work reduced the normal yield, 574,351 pounds of resin was obtained, from which was refined 412,965 pounds of rosin and 112,721 pounds of turpentine. The yield of crude resin per acre was about 145 pounds.

The Government's naval-stores industry centers on Baleq, Central Atjeh, a mountainous and isolated region.



Later information received through the United States Department of Commerce in regard to a 4,000-acre forest planting project undertaken by a South African company, mention of which was made on page 23 of the May, 1930, *Forest Worker*, is to the effect that although it was first planned to use one of the podocarps in this planting the final decision was to use *Pinus insignis*. The name of the company is the Afforestation Investment (South Africa) (Ltd.), registered at Pretoria.

## A Finnish Study of Pine Roots

Results of a morphological study of the root system of the Scotch pine, carried out in south Finland, were reported last year by Erkki Laitakari in *Acta Forestalia Fennica*. Sites were classified on the basis of Cajander's system of forest types. The material investigated consisted of 162 pines, 25 spruce, 4 birch, and 8 aspen; 72 complete root systems were dug out and investigated.

It was found that the direction of the prevailing winds in summer influences the direction of growth of the horizontal root system, in that the roots avoid the quarter of the prevailing wind and develop more abundantly in the direction whence winds blow with least frequency. Horizontal roots of pine were found to be longest on sandy heaths, clay soils, and moraine or gravel poor in stones, in the order named. Where stones were abundant in the moraine or gravel soils the roots remained short. Rich peat does not favor long roots, it appeared, but poor, wet peat does. Extent of root systems shows the same correlation to soil as length of roots. The root systems of all trees examined extended far beyond the range of the crowns.

It was found that outer vertical root systems develop, as a rule, where old stumps occur. On clayey and peaty soils the taproot and the vertical root system were absent, being replaced by a well developed, dense horizontal system round the base of the stem.

In no case did the volume of the roots exceed that of the stem. Considerable variation was found in the ratio between stem and root volume. Large trees had comparatively smaller volumes of root than small trees. The roots were proportionally smaller in dense woods than in open stands.

Intergrowth of roots seemed to occur frequently, especially near the bases of trees. As a result of this it seems that dead or felled trees may, through their roots, be of use to living trees. It was observed that the roots preferred to grow along channels of decaying or already decayed old roots. These observations point to the conclusion that a first crop of trees on a poor site may considerably assist a subsequent crop.

Examination of spruce roots indicated that the root system of spruce exceeds that of pines in total length and area. The depth of the horizontal root system of spruce was found to be considerably less. The root system of birch seemed to resemble that of pine in extent and depth.

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School children of Dauphin, Manitoba, collected 3,058 pounds of maple seed this year to be used in raising trees for planting on farms in the Prairie Provinces. The seed were turned over to Supervisor Smith of the Riding Mountain Forest to be sent to the forest nursery station at Indian Head, Saskatchewan.

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Canada's forest products laboratories now employ 90 or more persons, of whom more than 30 are university graduates with scientific training. Seventeen years after the beginning of its forest-products research work, in Montreal, the Dominion forest service now has a main laboratory at Ottawa, a branch laboratory at Vancouver, and a pulp and paper laboratory in Montreal.

## Personals

Sir John Russell, director of the Rothamsted Experimental Station, England, has been elected president of the International Congress of Soils. It is proposed to hold the next meeting of the congress in 1935 at Cambridge, England, and to follow the plenary sessions with a soils tour of the Mediterranean countries, including Spain, Algiers, Egypt, Palestine, Greece, Italy, and France.

Arthur Ringland has been appointed to a position in the agricultural foreign service now being organized in the United States Bureau of Agricultural Economics under provision of a recent act of Congress. Berlin has tentatively been chosen as his headquarters. The purpose in creating this position is to keep the Department of Agriculture in touch with European developments in the field of forestry as an aid in the development of American forestry. Particular attention will be given to land use in relation to forestry.

The Forest Service will be responsible for the technical direction of the work. Prior to the war Mr. Ringland was connected with the Forest Service for many years, during seven of which he was district forester in the Southwest. Following service in France with the Tenth Engineers (Forestry) and in Belgium with the Thirty-seventh Division, he examined war damage to French forests for the American Peace Commission. He was then assigned to the American Relief Administration, serving as chief of mission in Czechoslovakia for two years and in Constantinople for one and one-half years. Recently he has served as executive secretary of the National Conference on Outdoor Recreation and as member and secretary of the President's Coordinating Committee on National Park and Forest Boundaries, a Federal committee on the conservation of the elk of Jackson Hole, Wyo., and the President's Yellowstone National Park Boundary Commission.

Ernest Henry Wilson, keeper of the Arnold Arboretum of Harvard University, was killed in a motor accident in Worcester on October 1.

Robert Y. Stuart, Chief of the United States Forest Service, and Earle H. Clapp, Mr. Stuart's assistant in charge of the branch of research, have been elected fellows of the Society of American Foresters. Jean J. Jagerschmidt, of Paris, France, has been made a corresponding member of the society. Aimo Kaarlo Cajander, of Finland, and Robert Scott Troup, of Oxford University, have been made honorary members.

Mrs. William Boyce Thompson has been elected chairman of the board of directors of the Boyce Thompson Institute for Plant Research, Yonkers, N. Y., filling the vacancy left by the death of her husband, who founded the institute and endowed it during his lifetime to the extent of \$10,000,000. The other members of the board are: Charles F. Ayer, Raymond F. Bacon, William Crocker, Caleb C. Dula, Frederick H. Ecker, Robert A. Harper, Lewis R. Jones, Thomas La Mont, Fred J. Pope, and Margaret Thompson Schulze.

George A. Duthie has been appointed chief of the division of information in the Washington, D. C., office of the United States Forest Service, succeeding Ward Shepard. Mr. Duthie entered the Forest Service immediately after he received the master's degree in forestry from the University of Michigan, in 1909, and has been connected with the service continuously. He was for 17 years a forest supervisor, serving in that capacity on the Medicine Bow, Harney, and Black Hills National Forests. In his new position he has charge of informational and educational activities.

W. W. Ashe has been appointed chairman of the tree names committee of the United States Forest Service. The other members of the committee are W. A. Dayton, Perkins Coville, Arthur Koehler, and W. D. Brush. The duty of this committee is to gather evidence as to the propriety, validity, and use of common names of trees and to make recommendations to the Forester as to retaining, changing, or originating such names.

George E. Vincent, until recently president of the Rockefeller Foundation, has assumed the presidency of the Izaak Walton League.

Officers elected by the Association of State Foresters for the coming year are president, E. O. Siecke; vice president, Ben E. Bush; and secretary-treasurer, Ralph F. Wilcox. Frederick Dunlap and J. H. Foster have been elected members of the executive committee.

Edgar T. Wherry, in charge of the crop chemistry laboratory of the United States Bureau of Chemistry and Soils, has resigned to accept the position of associate professor of plant ecology in the department of botany, University of Pennsylvania.

George Stewart, head of the agronomy department of the Utah Agricultural College and agronomist of the State's agricultural experiment station, has accepted appointment as senior forest ecologist, Intermountain Forest and Range Experiment Station, Ogden, Utah. Since his graduation from the Utah State Agricultural College in 1913 Doctor Stewart has been engaged in research, graduate study, and teaching, dealing largely with agronomic problems of dry land and irrigation farming. He received the M. S. degree from Cornell University in 1917 and the Ph. D. degree from the University of Minnesota in 1926. His occupancy of the position which he now leaves dates from 1922. He is the author of a textbook on alfalfa growing and of many bulletins and papers, one of the bulletins dealing with the subject This Public Domain of Ours. At the forest experiment station he will have charge of a study of spring-fall and winter range.

Francis X. Schumacher has resigned from the forestry faculty of the University of California to become chief of the section of forest measurements in the Washington, D. C., office of the United States Forest Service. Mr. Schumacher is a forestry graduate of the University of Michigan, and before going to his California post had experience on national forests of the intermountain region. He has published a number of bulletins, the latest of which is Yield, Stand, and Volume Tables for Douglas Fir in California. V. A. Clements, whom Mr. Schumacher succeeds, has been assigned to the California Forest Experiment Station.

John R. Curry, assistant State forester of Maryland, has accepted appointment as associate silviculturist at the California Forest Experiment Station, where he will engage in forest fire research. Walter J. Quick, Maryland district forester with headquarters at Upper Marlboro, succeeds Mr. Curry as assistant State forester. C. F. Winslow, district forester at Pikeville, Tenn., succeeds Mr. Quick.

B. F. Heintzleman, assistant regional forester in Alaska, has spent several months in Washington, D. C., this fall working out the final arrangements for two large paper-making developments on the Tongass National Forest, Alaska, based on timber sales awarded in 1927. Each of these sales involves 5,000,000,000 board feet of timber. The way will be cleared for the two paper companies to which the sales were awarded to begin building paper mills, at Ketchikan and Juneau, immediately upon receipt of the necessary water-power permits, applications for which are now pending. A claimant to land on one of the power sites involved has sought to enjoin the Federal Power Commission from issuing a license, and the hearing on this suit before the Supreme Court of the District of Columbia has caused some delay in completing negotiations. In the negotiations with the paper companies Mr. Heintzleman represents the Federal Power Commission as well as the Forest Service.

George E. Mushbach, game protector of the United States Bureau of Biological Survey, has been appointed superintendent of the Bear River Migratory Bird Refuge, Utah. This appointment fills the vacancy created when David H. Madsen resigned to become a land purchaser in the National Park Service. Mr. Mushbach's headquarters are at Ogden, Utah.

S. B. Locke, for some years a technical assistant in the office of lands of the Ogden, Utah, headquarters of the United States Forest Service, has been appointed associate biologist in the Bureau of Biological Survey and assigned to the Intermountain Forest Experiment Station. Mr. Locke is a graduate of the University of Maine and holds the M. F. degree from the Yale School of Forestry. He has for some time been engaged in a study of the deer situation on the Kaibab National Forest. His first assignment in his new position will be a study of the rôle of rodents in erosion, although he will continue studies in game management.

Josef N. Knull has been appointed senior research entomologist at the Pennsylvania Research Institute, Mont Alto, Pa. Mr. Knull received the B. S. degree from the Pennsylvania State College in 1915 and a master's degree from the Ohio State University in 1924. He has had several years' experience in entomological work in Pennsylvania.

Charles K. McHarg, jr., has been transferred from the supervisorship of the Coeur d'Alene National Forest, Idaho, to take charge of the cooperative work of the United States Forest Service in north Idaho and east Washington under the Clarke-McNary Act. His headquarters are at Coeur d'Alene, Idaho. C. D. Simpson has been transferred from the supervisorship of the Lolo National Forest, Mont., to succeed Mr. McHarg, and has been succeeded by Theodore Shoemaker, heretofore assistant regional forester in charge of public relations in district 1.

A. G. Nord has been appointed to the supervisorship of the Wasatch National Forest, Utah, which was left vacant in July by the death of E. C. Shepard. Mr. Nord was made supervisor of the Ashley National Forest, Utah, in 1925. His successor in that position is James O. Stewart, who has been connected with the Ogden, Utah, office of the Forest Service as inspector of grazing.

John Glover Weir has been appointed extension forester for Vermont. Mr. Weir received the B. S. degree in forestry from Cornell University in 1927 and has served as an assistant district forester in Quebec. His headquarters are at the University of Vermont, Burlington, Vt.

L. I. Barrett has been transferred from the Central States Forest Experiment Station to the Appalachian Forest Experiment Station, where he will engage in growth studies.

K. D. Doak has been appointed in the Office of Forest Pathology, United States Bureau of Plant Industry, to study mycorrhiza. He will have headquarters at the Allegheny Forest Experiment Station, Philadelphia. Mr. Doak is a graduate of Purdue University, where he majored in pathology and completed most of the work required for the doctor's degree. He has published results of research on the cereal rusts, on a phanerogamic parasite on roots, and on mycorrhiza. A. B. Hatch, of the United States Forest Service, who has returned to the Allegheny station after a period of study in Sweden, will also be working on aspects of the mycorrhiza problem.

George L. Drake, since 1919 assistant in the office of forest management at the Portland, Oreg., headquarters of the United States Forest Service, has resigned to become assistant to the president of the Simpson Logging Co., Shelton, Wash. Mr. Drake, who is a graduate of the Pennsylvania State Forest School, has been connected with the Forest Service since 1910.

Roy E. Miller has been placed in charge of press relations of the Washington, D. C., office of the United States Forest Service. Mr. Miller is a graduate of the University of Missouri and has had journalistic experience in Missouri and California. He comes to his Forest Service position from that of city editor of the Colton (Calif.) Daily Courier.

Vernon E. Young has been appointed to the department of forest botany, New York State College of Forestry, to succeed Don Marion Benedict. Doctor Young received the B. S. degree from the Utah State College in 1922, the M. S. degree from the Iowa State College in 1924, and the Ph. D. degree from the University of Minnesota in 1929. He has made extensive ecological studies dealing with desert and mountain vegetation.

William J. Baker has been made head of the department of lumber manufacture in the school of forestry, Oregon State College. Mr. Baker received two forestry degrees from the college and has had several years' experience as timber inspector for the Southern Pacific Co., grader for the West Coast Grading Bureau, and dry-kiln superintendent for the Pacific Spruce Corporation, Toledo, Oreg.

A. M. Sowder, for the past three years Idaho extension forester, resigned September 1 to accept a position as assistant professor of forestry in the school of forestry of the University of Idaho. He will teach forest engineering, farm forestry, logging, and lumbering. Otto C. F. Krueger, a 1929 graduate of the Idaho School of Forestry, has resigned as a junior forester on the Gunnison National Forest, Colo., to succeed Mr. Sowder.

A. D. Folweiler, district forester at New Bern, N. C., has resigned to take up graduate work at the Yale School of Forestry.

L. G. Hornby, supervisor of the Flathead National Forest, Mont., has accepted a permanent assignment in the regional office of the Forest Service at Missoula, Mont., for the purpose of studying transportation problems with reference to fire control. Supervisor Kenneth Wolfe is to be transferred from the Selway National Forest, Idaho, to the Flathead. Supervisor James F. Brooks will be transferred from the Missoula National Forest, Mont., to the Selway.

John C. Kuhns, supervisor of the Whitman National Forest, Oreg., has been chosen to represent the United States Forest Service this winter as lecturer in the forest schools. Beginning about January 12, Mr. Kuhns will visit 13 schools, at each of which he will give three or four lectures on subjects relating to the work of the Forest Service and will confer with individual students.

Eitel Bauer, forester of the Cason J. Calloway Co., La Grange, Ga., has been added to the list of those to whom the Charles Lathrop Pack Forest Education Board has awarded forestry fellowships effective this year. Mr. Bauer will study silviculture and forest management at the Harvard Forest. Raymond H. Rogers, in charge of the Iroquois Forest of F. Ambrose Clarke, Cooperstown, N. Y., receives the eighth fellowship awarded by the board this year, and will make an economic study in the region centered about Cooperstown under direction of the New York State College of Forestry.

Henry Bull, of the Connecticut Agricultural Experiment Station, and Robert K. Winters, of the Central States Forest Experiment Station, have been appointed assistant silviculturists at the Southern Forest Experiment Station for work on southern hardwoods. Junior foresters recently added to the staff of this station are J. W. Cruikshank, a forestry graduate of Cornell, and Ralph C. Unger, of Syracuse, for the forest survey in the southern hardwoods; Frank Heyward, jr., of the University of California, and Carl F. Olsen, of Cornell, for naval stores work at Starke, Fla.; and R. R. Reynolds, of the University of Michigan, for economic studies.

Clyde S. Webb has been appointed supervisor of the Kootenai National Forest, Mont., filling the vacancy caused by the transfer of Supervisor Frank J. Jefferson to the Forest Service regional office at Missoula. Mr. Webb has had charge of field supervision of timber sales in region 1.

Kenneth C. McCannel, Lloyd T. Webster, and John Liersch are the recipients of the Anderson fellowships at the University of Washington College of Forestry for the year 1930-31. Mr. McCannel was graduated from the school with the bachelor's degree in 1926 and since then has been continuously in the employ of the British Columbia Forest Branch. Mr. Webster is a member of the class graduated from the school in 1930. Mr. Liersch is a 1927 graduate of the University of British Columbia and has had experience with the British Columbia Forest Branch.

## Bibliography

### Lodgepole Pine Seed Study Serves Double Purpose

By D. S. OLSON, United States Forest Service

An exceedingly helpful publication is the recent bulletin by C. G. Bates on *The Production, Extraction, and Germination of Lodgepole Pine Seed*.<sup>1</sup> Aside from its thorough treatment of the subject denoted in the title, this bulletin serves an even greater purpose at this time by showing research methods for similar studies of other timber species. After reading it a forester can not be content without a complete set of such studies covering the important timber species of the country.

Results are given of what was perhaps the first serious attempt in America to measure the seed pro-

duction of a timber stand over a period of years. The study was based on plots on the Medicine Bow National Forest, in southern Wyoming, and the Gunnison National Forest, in western Colorado, representing two climatic races of the species. Comparisons, as to quantity and quality, are made of the seed produced in each of 10 years on the two groups of plots; comparisons are made, also, of seed produced by different crown classes. One of the outstanding peculiarities of the lodgepole cone is its resistance to heat and its retention of the seed for three or four years after maturity. This peculiarity is a great aid to the natural reproduction of the lodgepole pine. Fire may dry and open the old cones on lodgepole pine trees and thus release the accumulated supply of seed to the ground, even while killing the trees themselves and all other seed of forest trees. Figures are given as to quantity and quality of seed collected from old as well as from new cones.

The author refutes the belief, common among foresters, that abundant cone crops are borne at regular

<sup>1</sup> U. S. Department of Agriculture Technical Bulletin No. 191. Copies will be furnished free of charge, as long as the supply lasts, by the Office of Information, U. S. Department of Agriculture, Washington, D. C., and are for sale by the Superintendent of Documents, Washington, D. C., at 20 cents each.



three or four year intervals. Records of minimum temperatures during the flowering period of the lodgepole pine and Douglas fir and records of cone crops of these species indicate a direct relation between low temperatures, with the consequent freezing of pistillate flowers, and cone-crop failures. The occurrence of bumper crops can therefore be no more regular than the occurrence of seasons favorable for the development of the flowers, is the author's contention. Now more difficult than ever becomes the explanation of another "common belief" that good cone crop years coincide for most species (and likewise years of crop failure), even though the pines require two growing seasons to mature their cones and the other conifers require but one.

Much has been written about seed extraction, but this bulletin goes vastly farther into the principles of cone drying. The action of heat alone does not suffice to cause the opening of cones. The essentials of any cone-drying kiln are a steady supply of hot, dry air; natural circulation of the hot air, which will rise readily through successive layers of cones; provision for arranging the cones in a single layer on each tray and for moving the trays downward, since the lowest tray always receives the most heat; provision for frequent shaking of the trays to cause loose seed to sift to the floor or a receptacle of lower temperature; and proper insulation to reduce heat waste by radiation.

Advantages and disadvantages of air drying of lodgepole pine cones as a preliminary to kiln drying are discussed.

The third part of the bulletin deals with methods of making germination tests that are applicable to many conifers.

A model seed-extracting plant for lodgepole pine cones is described and illustrated in an appendix.

## An American Study on Silvicultural Control of Wood Quality

By R. T. FISHER, Harvard Forest

Benson H. Paul's report on *The Application of Silviculture in Controlling the Specific Gravity of Wood*<sup>2</sup> embodies the results of the first considerable research of its kind in the United States. It indicates the principles which silviculture must apply if it is to produce the quality of product and hence the value which profitable forestry will demand.

After summarizing the results of previous European work on silvicultural control of wood properties Mr. Paul gives figures based on strength tests to show that specific gravity is a reliable criterion of the quality of wood. The body of the study deals with the determination of the specific gravity of wood samples from selected individual trees of a number of species, the

specimens of each species having been collected from various geographical sources and from stands varying in life history, especially with regard to density of stocking. The species used among the hardwoods were white ash, pignut and shagbark hickory, rock elm, sugar maple, and yellow poplar; among the conifers, loblolly, shortleaf, slash, and longleaf pine and second-growth redwood. The details of the tests are most interesting and conclusive. In brief it was shown that high specific gravity (or high quality of wood) is produced in the hardwoods by an early density sufficient to prune the boles, thinning to maintain a high rate of growth, and favorable soil conditions. In the conifers the relief of overdensity is likewise necessary to prevent unduly slow growth, but under certain conditions thinning results in lower specific gravity and hence in reduced strength. In short, "the regulation of growing space is the silvicultural tool which the forester can use most easily in controlling the specific gravity of wood." This conclusion is particularly significant as a complement to the facts, previously known, that the number and size of knots may be reduced by controlling density and the association of species, and that hardwoods in general and certain groups of species in particular are definitely soil-improving.

Every forester who has the opportunity or the hope of practicing silviculture will hail this bulletin as a real contribution to the technique of his trade.

## Chestnut Blight

By R. M. EVANS, United States Forest Service

A bulletin on Chestnut Blight<sup>3</sup> by G. F. Gravatt and L. S. Gill is one of the latest additions to an already considerable literature on this subject. It presents, briefly and clearly, information concerning the origin, spread, distribution, symptoms, and character of the disease, its effect on the merchantability of the wood, uses of blight-killed chestnut timber, and efforts being made to develop blight-resistant strains and to introduce blight-resistant species. Illustrations as well as text bring out the symptoms of the disease and the appearance of the cankers so clearly that there should be no difficulty in identification. All who are interested in this subject, seriously affecting the timber management of such a vast area, will welcome the bulletin as an up-to-date résumé of conditions.

It has been estimated that chestnut forms 25 per cent of the stand on some 33,000,000 acres of forest land in the southern Appalachians. Making use of the values of this material before they are destroyed constitutes a salvage job of major importance. The blight fungus appears to have no effect on the mechani-

<sup>2</sup> U. S. Department of Agriculture Technical Bulletin No. 168. For sale by the Superintendent of Documents, Washington, D. C., at 15 cents a copy.

<sup>3</sup> U. S. Department of Agriculture Farmers' Bulletin No. 1641. For sale by the Superintendent of Documents, Washington, D. C., at 10 cents a copy.



cal strength of the timber, and the utilization value of blight-killed chestnut should be no less than that of trees girdled with an ax and left standing. In this connection it is encouraging to note that the National Committee on Wood Utilization has interested itself in promoting the use of chestnut poles. The authors' statement that "sawed chestnut lumber is much in demand, but increased cutting \* \* \* tends to glut the market" appears to be very moderate. One has only to walk through a few mill yards and talk a little with the owners to discover how hard it is to dispose of accumulated stocks.

Not much hope is held out for the future of this valuable tree. It is explained that the blight has now spread to nearly all parts of the native chestnut range. Isolated trees and groups as far west as Michigan are affected. It is expected that the entire present stand will be destroyed. However, chestnut possesses a remarkable capacity for producing generation after generation of sprouts, and in the regions where blight has been present the longest some of these sprouts have now grown large enough to produce viable nuts. "It is reasonable to expect," the authors conclude, "that by selection among the seedlings growing from nuts of the sprouts a quick-fruited, moderately resistant strain of the American chestnut will finally be evolved."

### Ill Directed Forest Use

By F. H. EYRE, United States Forest Service

Much has been written about forest devastation by lumbering, insects, and disease, to say nothing of fire, and of damage to forests by animals that graze and trample; but little has been said of what forests suffer from the trampling foot of the public. A paper by E. P. Meinecke entitled "A Report Upon the Effect of Excessive Tourist Travel on the California Redwood Parks," published by the California Department of Natural Resources in 1928, cites a number of cases in which decidedly too many human feet have been set on the forest floor. Doctor Meinecke, who is a pathologist in the Office of Forest Pathology, Bureau of Plant Industry, says that the fundamental object of the withdrawal of redwood groves is to preserve them for the enjoyment of present and future generations of Americans. "If the redwoods were merely saved from the ax to fall victims to the slow but fatal change in their living conditions brought about by excessive tourist travel, the main purpose of creating the parks would certainly fail."

The author first compares conditions in the redwood groves with city park conditions. He points out that old forest trees are unlike those in city parks, which are relatively young, have been planted and cultivated by man, and can be quickly replaced in case of death. Park trees have adjusted themselves to an environment far different from that of the forest. The forest

association is made up of "a wild population of trees which have attained old age as a result of a highly complex competition with each other and the many other plants. \* \* \*"

"It is well known that plants grown old in the wild state do not take kindly to contact with civilization"—even the redwoods, although their hardness is attested by their great age. Investigation of conditions in several groves disclosed the fact that the trampling of many thousands of tourists has severely injured many of the redwoods, has killed some associated species such as Douglas fir and tanbark oak, and over large areas has entirely destroyed the lower vegetation of ferns and flowering plants. The heavy travel has compacted the soil surface into a tough, leathery layer which neither air nor water can penetrate. Wherever this soil compacting has occurred the feeding roots of the trees, which are always close to the surface, have been killed in large numbers, and where not killed have been rendered incapable of functioning properly. Natural conditions have thus been completely altered. They can not be restored, but there is hope for some improvement.

To improve growing conditions for the redwoods by controlling the public is by no means a simple task. The erection of fences or other artificial barriers is very objectionable. Even signs would detract from the natural beauty of the groves. In sizing up the problem and determining what is to be done about it Doctor Meinecke shows a keen appreciation of the habits of the tourist public. He says that "man goes preferably where others have gone before. He camps in what others before him have found desirable camping ground. \* \* \* The average tourist, coming from city or town, neither feels perfectly at home in the forest nor is inclined to exert himself unduly. He follows the beaten path and therefore the easiest path." With these traits of the tourist in mind the author recommends that the concentration of travel be counteracted first by removal of all buildings from the forest, with provision for camping and car parking in parts of the groves other than those which contain the largest trees. Then by properly placing natural obstacles such as logs and heavy limbs, and by laying out trails so that they go through thick undergrowth, public travel can be confined to restricted lanes. Finally by loosening the soil through careful cultivation it is hoped that favorable soil conditions can be restored in part on severely trampled areas.

It seems reasonable to believe that many tree species in other regions may be no less susceptible to damage by tourist traffic than the redwoods. Meinecke's findings and recommendations should be of interest to all who are charged with the administration of forest areas that are used by the public for recreation, especially areas on which it is desired to preserve natural conditions.

## A Textbook on Silvics

By THURMAN J. STARKER, Oregon State College

For many years teachers of silviculture have struggled along with notes picked up during their own college days, to which they added from time to time something extracted from a Forest Service or private publication. This was particularly true of that branch of silviculture known as silvics, the science which treats of the lives of the trees in the forest. Because of the fragmentary nature of our knowledge of silvics and because some of the silvical data in use were questionable, it appeared that no one wanted to risk his reputation by publishing a book on this subject. Publication of a book entitled "Silvics"<sup>4</sup> by E. G. Cheyney, professor of forestry in the University of Minnesota, therefore entitles Professor Cheyney to congratulations as one of the pioneers in this field in the United States; and I am sure that teachers and students of forestry will welcome this addition to the literature of their subject.

This book is in mimeographed form and consists of 149 pages. It is divided into three parts, which are devoted, respectively, to factors affecting tree growth, description of forest regions and types, and a short silvical description of each important forest tree of the United States.

The discussion of pure silvics is very much abbreviated, taking up only the first 22 pages. Wind, for example, is given but two short paragraphs, one dealing with the effect on evaporation and the other with the effect on the form of the tree. The discussion does not cover such relationships as wind and the distribution of moisture, wind and the distribution of pollen and seed, wind and its effect in modifying temperature, wind and soil transportation, wind and uprooting and breakage, wind resistance of various species, and wind and fire. Several other site factors are ignored entirely. Thus, if criticism were offered, it would be on the basis of too extreme brevity for a college textbook on silvics. What Professor Cheyney has offered in this portion of his book is fundamental and "meaty."

In Part II, which occupies 39 pages, the principal forest regions are discussed as to topography, types, species, underbrush, flowering plants, rainfall, and soil. This is in sufficiently brief form to make interesting reading, and represents a great deal of work.

In Part III, the major portion of the book, each of the important forest trees of the United States is considered as to general range, stand habits, seed production, tolerance, etc. This represents an enormous quantity of work in boiling down material previously published on these trees. In each case the source of the information is given. It is to be regretted that the scientific names of the trees mentioned are often misspelled.

<sup>4</sup> Burgess-Roseberry Co., Minneapolis, Minn.

## Forestry and Forest Fires in Arkansas

By W. R. HINE, Secretary, Society of American Foresters

At last a thorough analysis has been made of the forest problem of Arkansas. The analyst is E. M. Bruner, district forest inspector, United States Forest Service, and the results have been published as Extension Circular No. 281 of the Arkansas Extension Service, under the title "Forestry and Forest Fires in Arkansas."

In this study, to which Mr. Bruner was assigned at the request of Gov. Harvey Parnell, all possible assistance was given by the Arkansas Agricultural Extension Service, the Arkansas State Chamber of Commerce, many other groups interested in Arkansas forests, and a host of local officials. In order to bring up to the minute the information provided by these agencies Mr. Bruner in the fall of 1929 visited every county in the State, studying forest conditions through personal observation and discussion on the ground.

As Mr. Bruner says, the Arkansas of the early pioneer was a veritable forest empire. Forests including splendid stands of both pine and hardwood extended over 32,000,000 acres of the State, practically its whole area. Cutting for lumber, clearing for agriculture, and development of cities and towns have now reduced the old-growth forests to approximately 2,000,000 acres. There is perhaps 5,000,000 acres of thrifty second growth, and 15,000,000 acres of second growth more or less ravaged by fire. On about 2,000,000 acres fire damage has been so severe that reforestation will not take place except by artificial means. Heavy cutting and repeated fires have greatly curtailed the forests' production. The total stand of timber, once perhaps 200,000,000,000 or 300,000,000,000 board feet, has been reduced to about 40,000,000,000 board feet.

Briefly summarized, the Arkansas forest problem is one of approaching exhaustion of the old growth, lack of appreciation of the value of the growing forest, and widespread destruction by forest fires. As Mr. Bruner says, "fires literally run wild in the woods of Arkansas." Each year 10,000 or more fires are intentionally set. From long familiarity with the incendiary problem as it exists in Arkansas and elsewhere in the South Mr. Bruner is able to give an excellent analysis of the reasons behind this fact.

An especially informative section of the report describes the many ways in which fires damage the fire-resistant pines and the hardwoods.

Arkansas forest trees reproduce so quickly, grow so rapidly, and produce such excellent lumber and other forest products that I am inclined to think the possibilities of growing profitable forest crops in Arkansas might have been stated more emphatically in this bulletin. Studies of the Southern Forest Experiment Station of the United States Forest Service, which as Mr. Bruner states have revealed that the shortleaf pine grows faster in south Arkansas than anywhere else in its

range, have further shown that on Arkansas areas carefully protected from fire 60 cords of pulpwood per acre has been produced in 30 years and 50,000 board feet of lumber in 50 years. Over considerable areas of the best soils in south Arkansas careful protection and intelligent management will make possible the production of at least 500 board feet of timber per acre per year.

Farmers and other small landowners have a special opportunity to profit by the prevention of forest fires in Arkansas. Of the 20,000,000 acres of privately owned forest land in the State 13,500,000 acres, or 67½ per cent, is included in holdings of less than 1,000 acres. Of this total 5,500,000 acres is owned by farmers. The Federal and State Governments together own about 2,000,000 acres of forest land in the State.

Every county in Arkansas is faced with the forestry problem; not a single county has less than 35 per cent of its area in forest cover of one kind or another, and in every part of the State heavy cutting and fire destruction have had their effect.

Organized cooperation for the prevention and suppression of forest fire is the solution offered by Mr. Bruner. "Forest destruction in Arkansas," he says, "is due primarily to the traditional habit of woods burning. Effective fire prevention requires above everything else that the individual citizen must be brought to realize his personal responsibility in keeping fire out of the woods." The program he suggests would seek through every educational facility available to overcome the lack of information, the prejudice, and the carelessness which are the reasons behind Arkansas forest fires. Next it would provide systematic preparation for effective control and suppression of such fires as do start. Cooperation on the part of the landowners, the State, and the Federal Government is indicated as an essential factor in this program.

Those interested in forestry in Arkansas or in the South will find this bulletin full of interesting facts. It is well illustrated with many photographs of Arkansas forests and forest industries. A feature deserving special mention is a set of graphs by R. P. Holdsworth, formerly professor of forestry at the University of Arkansas.

## A Good Forestry Text for Schools

By L. C. EVERARD, Editor, American Association of Museums

Though the subtitle is *First Steps in Southern Forest Study*, Mrs. D. P. Edgerton's book *Southern Forests*<sup>5</sup> goes a long way into the subject of what forests are and what they mean to people. An introductory section outlines the contribution of forests to the economic and social progress of the United States. There is also a paragraph on the different forest regions of the country and one on the migratory character of the lumber industry in the past, and several

pages on the importance of southern forests. The main body of the book is cast in the form of four lessons, one each on the individual tree, the forest as a tree community, the products and influences of the forest, and the forests of the world and their conservation. The concluding chapter deals with observances like Arbor Day, school collections for forestry study, and field work.

Two pedagogical devices are used with special effectiveness. One is the lesson problem, which is used both to stimulate the pupil's interest and to suggest new thought on the material presented in the text. The other is the appeal to the eye. The 130 illustrations are well chosen and clearly reproduced. With their accompanying legends they are in themselves an introduction to forestry study.

The book provides adequate and authentic study material, presented in such form as to fit in harmoniously with school curricula of the present day. It has in addition a lot of ingenious suggestions for use both in and out of the classroom and bears evidence throughout of the author's practical acquaintance with forestry teaching in the public schools. Mrs. Edgerton now and then overindulges her liking for metaphor and in some instances such as the section on foreign forests passes along quickly where another might place emphasis, or vice versa. As a whole, however, the book is unusual both in quality of content and in adaptation for use in introducing school children to the study of forestry.



Paul W. Stickel, of the Northeastern Forest Experiment Station, has published a translation from the German of the paper on *Investigations of the Significance of Tree Mycorrhiza* written in 1925 by Elias Melin, of Sweden. The translation appears as a book of 173 pages lithoprinted by Edwards Bros., Ann Arbor, Mich.

## Recent Books and Pamphlets

Gamble, T.: *Gamble's international naval stores year book for 1930-31*. 176 pp. illus., diags. Savannah, Ga., 1930.

Georgia Commercial Forestry Conference, Savannah, May 26-28, 1930. 108 pp. (Georgia Forest Service bulletin no. 11.) Atlanta, Ga., 1930.

Gevorgiantz, S. R., and Zon, R.: *Second-growth white pine in Wisconsin: its growth, yield, and commercial possibilities*. 40 pp. illus., diags. (Wisconsin Agricultural Experiment Station research bulletin 98.) Madison, Wis., 1930.

Hansen, N. E.: *The shade, windbreak, and timber trees of South Dakota*. 48 pp. illus. (South Dakota Agricultural Experiment Station bulletin no. 246.) Brookings, S. Dak., 1930.

Inter-American Conference on Agriculture, Forestry, and Animal Industry. *Documentary material*. 434

<sup>5</sup> *Southern Forests*, by Mrs. D. P. Edgerton, formerly Mississippi State Supervisor of Forestry Education. Rand McNally & Co., New York, 1930.

- pp. Government Printing Office, Washington, D. C., 1930.
- Knuchel, H.: Untersuchungen über den einfluss der fällzeit auf die eigenschaften des fichten- und tannenholzes, pt. 1. 127 pp. illus., pl., diags. (Schweizerische Zeitschrift für Forstwesen. Beiheft no. 5.)
- Markwardt, L. J.: Aircraft woods: their properties, selection, and characteristics. 34 pp. diags. (United States National Advisory Committee for Aeronautics report no. 354.) Washington, D. C., 1930.
- Morozov, G. F.: Die lehre vom walde. 375 pp. illus. J. Neumann, Neudamm, 1928.
- New Jersey Department of Conservation and Development: Work of the division of forests and parks, July 1, 1927, to June 30, 1929. 24 pp. Trenton, N. J., 1930.
- Oregon: Laws, statutes, etc.: Oregon forest laws, 1929. 53 pp. State Printing Department, Salem, Oreg., 1930.
- Pennsylvania: Laws, statutes, etc.: Game, fish, and forest laws, 1929-1930. 322 pp. Harrisburg, Pa., 1930.
- Plummer, C. C., and Pillsbury, A. E.: The white pine weevil in New Hampshire. 32 pp. illus., diags. (New Hampshire Agricultural Experiment Station bulletin 247.) Durham, N. H., 1929.
- Tryon, H. H.: The Black Rock Forest. 42 pp. illus., maps. (Black Rock Forest bulletin no. 1.) Cornwall, N. Y., 1930.
- United States National Committee on Wood Utilization: You can make it for camp and cottage: practical uses for second-hand wooden containers and odd pieces of lumber. 48 pp. illus. Washington, D. C., 1930.
- Van Hise, Charles Richard: Conservation of our natural resources, based on Van Hise's The conservation of natural resources in the United States, by L. Havemeyer and others. 551 pp. illus., maps, diags. The Macmillan Co., New York, 1930.
- Vermont Forest Service: Vermont State forests. illus. (Publication no. 36.) Montpelier, Vt., 1930.
- Forstarchiv, August 1, 1930.—Der jetzige stand der samenherkunftsprüfung, by W. Schmidt, pp. 307-314.
- Industrial and Engineering Chemistry, July 15, 1930.—An electric conductivity method for determining the moisture content of wood, by A. J. Stamm, pp. 240-244. August, 1930.—Production of pulp in the Pacific Northwest, by H. K. Benson, pp. 818-822.
- Journal of Forestry, May, 1930.—Origin and propagation of forestry ideas, by M. E. Tkatchenko, pp. 595-617; Development of silvicultural practices in the California national forests, by T. D. Woodbury, pp. 693-700; Quantity and nutrient contents of pine leaf litter, by F. J. Alway and R. Zon, pp. 715, 727. October, 1930.—Forest soil research in relation to forestry, with particular reference to the Northeast, by L. G. Romell, pp. 841-848; Mycorrhiza studies; the duration of certain pine mycorrhiza, by A. P. Kelley, pp. 849-852.
- Pulpwood, July, 1930.—European forests and the paper industry, by C. W. Boyce and others, pp. 1-9.
- Quarterly Journal of Forestry, October, 1930.—Capital and interest, by N. A. Orde-Powlett, pp. 277-284.
- Zeitschrift für Forst- und Jagdwesen, July-August, 1930.—Die versuche über den einfluss der herkunft des kiefernensamens, by E. Wiedemann, pp. 498-522. September.—Ueber den zusammenhang zwischen der holzqualität und der jugendentwicklung der kiefer, by Olberg and Kühn, pp. 625-658.

## Recent Publications of the Forest Service

- Department Bulletin 1136-D, Kiln Drying Handbook (reprint).
- Technical Bulletins: 158-T, Comparative Strength Properties of Woods Grown in the United States (reprint); 201-T, Yield of Douglas Fir in the Pacific Northwest; 204-T, Timber Growing and Logging and Turpentine Practices in the Southern Pine Region; 205-T, Gluing Wood in Aircraft Manufacture; 209-T, The Determination of Hour Control for Adequate Fire Protection in the Major Cover Types of the California Pine Region.
- Circulars: 120-C, Growing Trees for Forest Planting in Montana and Idaho; 124-C, Rate of Growth of Second-Growth Southern Pines in Full Stand; 125-C, Experiments in the Use of Fertilizers in Growing Forest Planting Material at the Savanac Nursery; 128-C, Effectiveness of Moisture-Excluding Coatings on Wood; 131-C, Utilization of Black Locust.
- Leaflets: 55-L, Small Trees Wasteful to Cut for Saw Timber (revised); 62-L, Why Some Wood Surfaces Hold Paint Longer than Others.
- Miscellaneous Publication 87-M, Profits from Farm Woods.

## Articles in Periodicals

- Centralblatt für das Gesamte Forstwesen, 1930.—Grundlegende forstökonomische betrachtungen, by E. Bazala, pp. 201-241.
- Crosstie Bulletin, July, 1930.—Some hardwood growth possibilities in lower Mississippi Valley, by G. H. Lentz, pp. 2-6.
- Forestry, May, 1930.—Planting tools and methods, by J. McEwen, pp. 15-25; The bearing of some ecological conceptions on the formation of plantations, by H. M. Steven, pp. 26-33.

